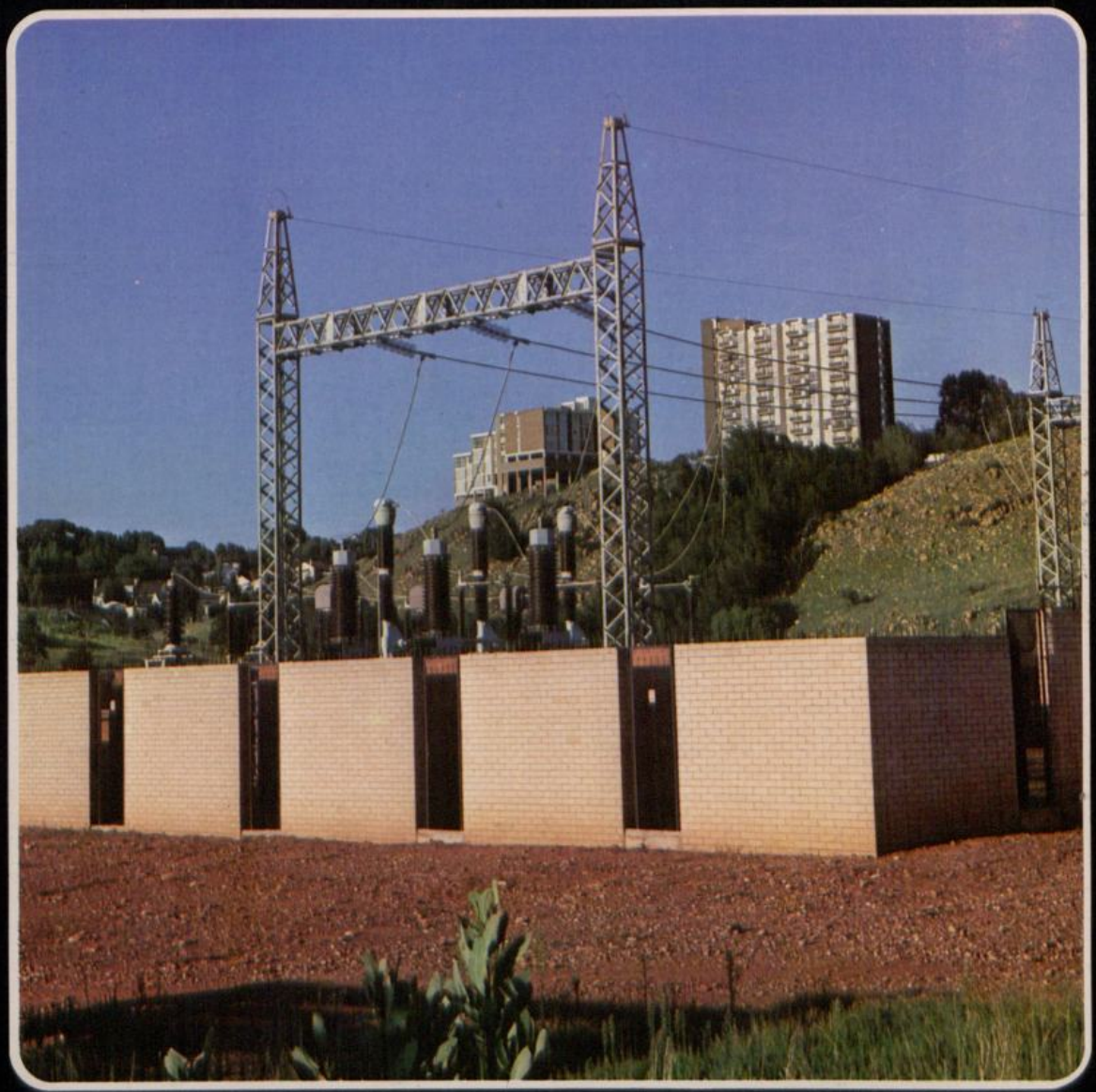
46 KONVENSIE CONVENTION

THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTH AFRICA

DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS VAN SUID-AFRIKA

27 February — 1 March 1979
27 Februarie — 1 Maart 1979



ROODEPOORT

We've turned a substitute for ivory into a mammoth industry.

John Wesley Hyatt was merely trying to find a replacement for ivory when he made his first plastic in the late 1860's.

Today plastics are finding new applications in the replacement of traditional materials such as wood, metals, asbestos and glass.

Thermoplastics, plasticisers, synthetic resins and solvents produced by Sentrachem through its subsidiaries and joint ventures are used in making an ever increasing variety of products ranging from Aircraft canopies to Zip fasteners.

By using South African coal, anthracite, lime and other raw materials from Sasol – limiting our imports to small quantities of highly specialised materials – we have created a multimillion rand industry of vitally strategic importance.

Supplying the plastics industry with indigenous Plasticlor and Phthalate Plasticisers, Polyester Resins, Surface Coating and Adhesive Resins, Paint Additives, Polystyrene, High Density Polyethylene, Polypropylene and Polyvinyl Chloride.

Our total commitment to plastics involves constant research. Solving old problems. Breaking new ground. And our expertise and excellent back-up services are always at your disposal.

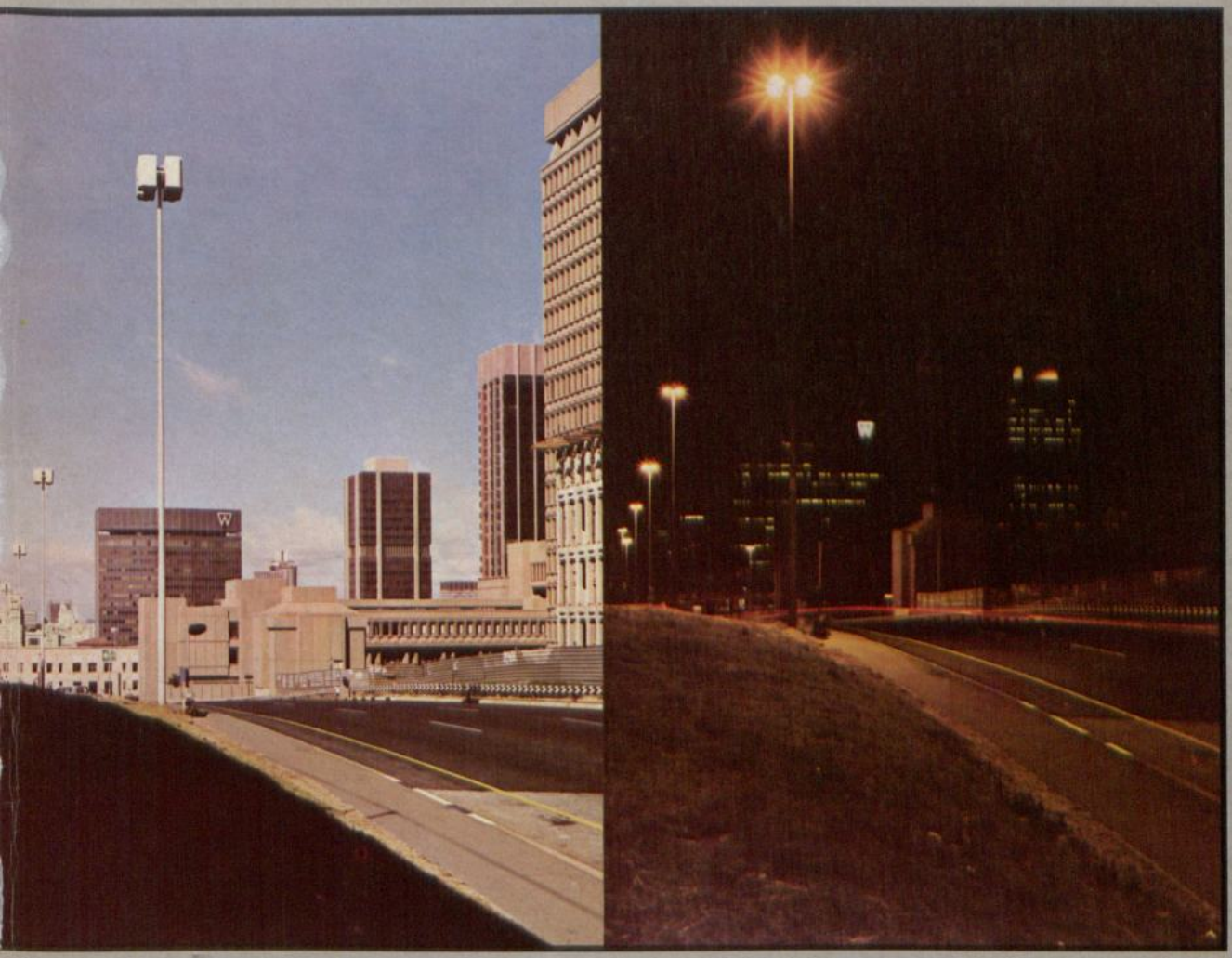
Sentrachem

The Sentrachem Group, P.O. Box 61204, Marshalltown 2107. Tel: (011) 836-2075.

Incorporating on the plastics side: Coalplex Division. • Safripol (Pty) Ltd. • Impala Plastics (Pty) Ltd. • Plastomark (Pty) Ltd. National Chemical Products Ltd. • Styrochem (Pty) Ltd. • Poly Resin Products Ltd. • Klipfontein Organic Products Corp Ltd.

VZ78/JS370

PHOSWARE LIGHTING



Johannesburg Civic Centre — By courtesy of Johannesburg Municipality

To ensure that our products comply with the particular specification concerned and to set a seal of reliability upon the data we publish we have constructed our own Lighting Laboratories in Springs. Quality controls as well as design and development of lighting equipment are some of the Laboratory functions. Visitors are welcome.

Phosware
(PTY) LTD.

JANSEN ROAD, NUFFIELD,
SPRINGS, TRANSVAAL
TELEPHONE 818-5811/2.
P.O. BOX 391, SPRINGS 1560

Full coverage

A complete range of motor control and switchgear – from components to prewired load and control centres.

KLOCKNER-MOELLER

MOTOR CONTROL AND SWITCHGEAR

Head Office and Factory:
P.O. Box 100, Kempton Park,
Transvaal, 1620
Telephone 975-3937
Telex 8-6308

A complete Range from Components to prewired Load and Control Centres

Technical Branch Offices and Factories:
Johannesburg East, West and South
Cape Town, Durban, Port Elizabeth and Welkom

Electricity, water, sewerage, traffic. Without these a city stops dead.

Every second of the year the services that citizens take for granted have to be provided, monitored and controlled.

Electricity – switchgear from 3,3 kV to 132 kV are manufactured in South Africa to local and international standards. Small oil volume and SF6 technologies cover the field of applications. High voltage CT, VT and CVT also supplied for network protection.

Designed and manufactured in South Africa, the Fulcontrol 6000 range of Telemetry and Telecontrol equipment provides remote control and data acquisition in a wide variety of applications.

All models provide maximised information transfer, automated maintenance routines, high reliability, compact packaging and the very latest microprocessor technology.

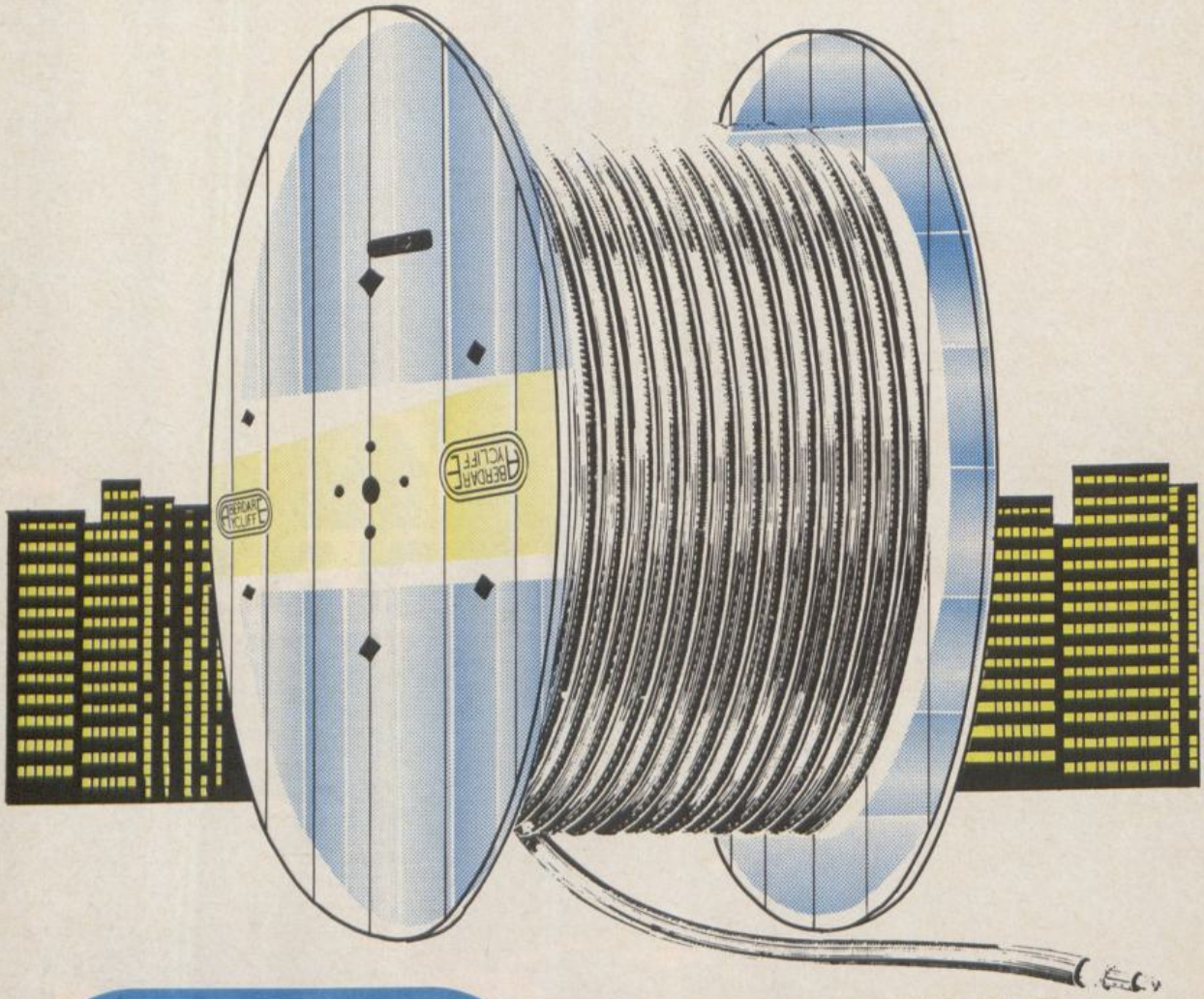
Call us for information today and find out just how Fulmen Africa can keep your city moving.

Fulmen

A CITY NEVER SLEEPS.

Fulmen Africa (Pty) Ltd., 11 Cross Street, Tunney Industrial Township, P.O. Box 8023, Elandsfontein, 1406. Tel. 36-5201.

Introducing our New Look drum



ABERDARE CYCLIFF

PORT ELIZABETH AND EDENVALE

Aberdare and Aycliffe got together a while back, but it took our drums a little longer. You see, it was difficult to decide whose drum was best ... when they both were.

What it amounts to is that we have decided to produce a new-look drum which also incorporates the names of Aberdare and Aycliffe in a new symbol. A symbol guaranteeing the high standard of our cables. Cables serving the living needs of light, warmth, power and communications of our land. Aberdare Aycliffe cables, backed by unequalled technical service.

Look at our new drum and remember what we stand for.

Admark Advertising 5279

Lovely sangamo the best looking meter made.

STOP PRESS!

SUPPLIERS OF LOAD-RATE METERS TO RICHARDS BAY COUNCIL

30 years of faithful service without maintenance.

- Extremely accurate
- Wide load range
- Maintenance free "Floton" bearing
- Stable in all climatic conditions

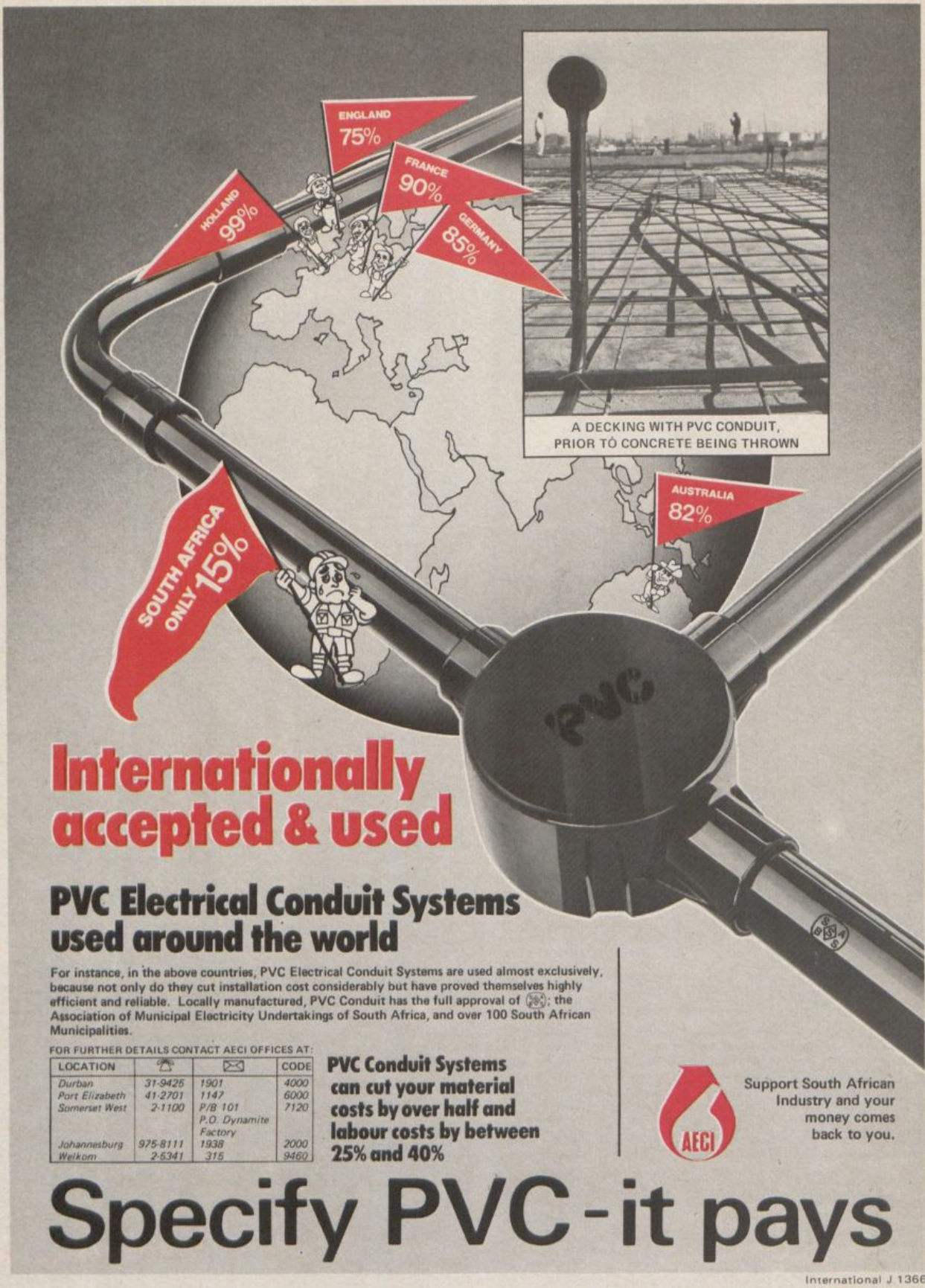
Call us if you're after an outstanding meter. We'll gladly send you a detailed breakdown on our lovely Sangamo.

Hubert Davies
ELECTRICAL ENGINEERING

A Hubert Davies Engineering Supply Company

Johannesburg: P.O. Box 1386, Johannesburg 2000. Tel. 36-2511. Telex 8-0593.
Cape Town: P.O. Box 333, Bellville 7530. Tel. 95-2171. Telex 57-7223.
Durban: P.O. Box 1173, Pinetown 3600. Tel. 72-2301. Telex 6-5029.
Port Elizabeth: P.O. Box 2004, North End 6056. Tel. 42-2061. Telex 74-7011.
or through any Hubert Davies Engineering Supply Company branch countrywide.

3472



Internationally accepted & used

PVC Electrical Conduit Systems used around the world

For instance, in the above countries, PVC Electrical Conduit Systems are used almost exclusively, because not only do they cut installation cost considerably but have proved themselves highly efficient and reliable. Locally manufactured, PVC Conduit has the full approval of (SABS); the Association of Municipal Electricity Undertakings of South Africa, and over 100 South African Municipalities.

FOR FURTHER DETAILS CONTACT AECI OFFICES AT:

LOCATION	☎	✉	CODE
Durban	*31-9425*	*1901*	*4000*
Port Elizabeth	*41-2701*	*1147*	*6000*
Somerset West	*2-1100*	*P/B 101*	*7120*
		P.O. Dynamite Factory	
Johannesburg	*975-8111*	*1938*	*2000*
Welkom	*2-5341*	*315*	*9460*

PVC Conduit Systems can cut your material costs by over half and labour costs by between 25% and 40%

AECI

Support South African Industry and your money comes back to you.

Specify PVC - it pays

International J 13661

FEBRUARIE — FEBRUARY 1979
INHOUD — CONTENTS

PUBLISHERS AND PROPRIETORS
UITGEWERS EN EIENAARS

The Association of Municipal Electricity Undertakings of South Africa.
Die Vereniging van Munisipale Elektrisiteitsondernemings van Suid-Afrika.

GENERAL EDITOR AND ADVERTISING MANAGER
ALGEMENE REDAKTEUR EN ADVERTENSIEBESTUURDER

Bennie van der Walt
Tel.: 838-7711
Johannesburg.

OFFICES
KANTORE

Volkskasgebou 613, Volkskas Building
Markstraat 76, Market Street
JOHANNESBURG
Tel.: 838-7711
2001

VERRIGTINGE
46STE KONVENSIE
27 FEBRUARIE TOT 1 MAART 1979
RAU OUDITORIUM

PROCEEDINGS
46TH CONVENTION
27TH FEBRUARY TO 1 MARCH 1979
RAU AUDITORIUM

Ds. J. G. W. Roos het die verrigtinge geopen met skriflesing en gebed.
Rev. J. G. W. Roos opened the proceedings with scripture reading and prayer.

TABEL VAN BYWONING/TABLE OF ATTENDANCE

Erelede	8	Honorary Members
Gaste	39	Guests
Ingenieurs	64	Engineers
Geassosieerdes	6	Associates
Assosiaat Lede	15	Associate Members
Plaaslike Besture	84	Local Authorities
Geaffilieerdes	139	Affiliates
Dames	176	Ladies
Personeel	12	Staff
	543	

Verskonings 20 Apologies

AMPTELIKE OPENING

MNR. K. G. ROBSON (PRESIDENT)

My innige dank aan u, ds. Roos, vir u boodskappe aan ons in die skriflesing en gebed.

It is with a sense of sadness that we record the deaths during the past year of:

George Jones, Past Member and former Town Electrical Engineer, Mafeking;

R. W. (Bob) Kane, Past President and Honorary Member and former General Manager, Electricity Department, Johannesburg;

Peter Capra, GEC Power Distribution (Pty) Ltd.,

J. S. Craig, Engineer Member and former Town Electrical Engineer, Greytown.

I ask you to stand while we remember them with proud thanksgiving.

It is my privilege to acknowledge the presence with us this morning of a number of distinguished Past Presidents and Honorary Members and I ask them to stand when I call their names:

Mr. J. L. van der Walt	Mr. Gawie Theron
Mr. Ronald Simpson	Mr. Jules von Alphten
Mr. Chris Lombard	Mr. Eugene Pretorius
Mr. Percy Giles	Dr. R. L. Straszacker
(Mr. Jack Downey)	Mr. Derek Plowden
Mr. Bob Barton	Mr. Bob Leishman
	Mr. W. H. Milton

Salutations! Go Well!

'n Formele maar waarlik opregte verwelkoming word gerig aan die volgende vooraanstaande verteenwoordigers wat ons almal en die VMEO met hulle teenwoordigheid vanoggend vereer:-

Mnr. A. P. Burger, Verteenwoordiger van die Instituut van Stadsklerke van Suidelike Afrika, ere-regsadviseur en ou vriend van die VMEO.

Dr Ralph Anderson, representing the South African Institute of Electrical Engineers and a respected contributor to AMEU Conventions for many years.

Our congratulations to you, Dr Anderson, on your recent induction as President of the Institute.

Mnr. S. J. Venter, verteenwoordiger van die Instituut van Munisipale Tesouriers en Rekenmeesters, S.A.

Mnr. C. J. Voigt, verteenwoordiger van die Instituut vir Organisasie en Metodes (Plaaslike Bestuur).

OFFICIAL OPENING

Mnr. A. J. van Schalkwyk, verteenwoordiger van die Transvaalse Munisipale Vereniging.

Mnr. D. F. Toerien, verteenwoordiger van die Departement van Plaaslike Bestuur, Transvaalse Provinsiale Administrasie.

Sy Edelagbare die Burgemeester van Roodepoort, raadslid Bennie van der Walt en mev. A. van der Walt, mnr. A. R. Hough, gaste, dames en here.

Dit is vir my as President 'n besondere eer en voorreg om u almal by hierdie geleentheid welkom te heet — die opening van die 46ste Konvensie van die Vereniging van Munisipale Elektrisiteitsondernemings van Suid-Afrika, vier-en-sestig jaar sedert die stigting.

Ek is veral bly oor die geëerde teenwoordigheid van ons baie goeie vriend, raadslid Bennie van der Walt, die Burgemeester van Roodepoort, die gasheerstad vir hierdie Konvensie, nieteenstaande die feit dat ons in hierdie pragtige gehoorsaal van 'n Johannesburgse universiteit vergader.

Dit is nou met groot genoeë dat ek Sy Edelagbare die Burgemeester, raadslid Bennie van der Walt, vra om u by die Konvensie te verwelkom.

VERWELKOMINGSTOESPRAAK DEUR SY AGBARE DIE BURGEMEESTER VAN ROODEPOORT RLD. BENNIE VAN DER WALT

Mnr. die President, Hoogwaardigheidsbekleërs, lede van die VMEO en dames, ek staan vanmore hier voor u soos die persoon wat aangestel was in vele komitees. Toe hy by een geleentheid 'n toespraak moes lewer, het dit hom heeltemal ontgaan wie hy verteenwoordig, hy sê toe:

"Hier staan ek nou in my hoedanigheid . . . ?"

Nouja, hier staan ek as die Burgemeester van Roodepoort, en u kan ook gerus simpatiseer soos toe die gammat aan sy maat gesê het wie se vrou oorlede is: "My sympathetic congratulations."

I find myself in the position that Shakespeare described so aptly, viz:

"All the world's a stage, and all the men and women merely players: They have their exits and their entrances: and one man in his time plays many parts, his act consists of seven ages."

Meneer die President, dit is voorwaar vir my baie aangenaam om u een en almal van oor die hele Suidelike-Afrika hartlik te verwelkom na die 46ste Konvensie van die VMEO. Ja, seker een van die grootste Munisipale byeenkomste.

Rld. Bennie van der Walt, besig om die afgevaardigdes te verwelkom. By die hooftafel sit ook van links na regs mnre. Giel Gericke (hulp sekretaris), A. R. Hough, Ken Robson, Piet Botes, Ds. J. G. W. Roos en J. S. du Toit, Stadsklerk van Roodepoort.

Namens my vrou Annatjie, Burgemeestersvrou, rig ek 'n spesiale woord van verwelkoming aan die dames vir wie daar 'n besondere program gereël is. My vrou sien daarna uit om u almal te laat tuis voel.

Daar is ook afgevaardigdes wat die Konvensie vir die eerste keer bywoon. Aan hulle sê ons 'n spesiale woord van welkom en vertrou dat hulle die Konvensie baie interessant sal vind.

Mr. President, I believe that this Convention's main justification is its educational value. A convention can be one of the most effective ways of increasing the knowledge and expertise of members. It allows delegates the opportunity to test their ideas and assumptions before a wider audience than which is usually available.

Very often a Convention is the only place where members get together to meet one another. It is a positive factor in retaining existing membership, it builds new membership and ensures the continued health and growth of the organisation.

The success of a Convention must relate to the degree in which it serves the delegates participating, and in particular the community, as human material resources are being used and a beneficial result is a requirement.

A Convention is to my knowledge the best known form of communicating with other people, or other groups of people.

It is true that personal involvement of the participants is limited due to the time schedules and formal presentations. The benefits are sometimes so hidden that such factors as the quality of night life or number of golf courses available, become the most memorable factor in a delegate's mind.

Mr. President, it is my wish that this Convention, and for that matter, all Conventions of the AMEU will teach the members to learn and appreciate the technical aspects of electricity supply: that their skills will be such that they may present the technical aspects of their duties in a language and style easily understandable by their councils and the general public: that they may be willing to guide and assist all those with whom they may come in contact: that the delegates will regard themselves as colleagues and give one another due confidence and respect and that their accuracy, their knowledge, their integrity will win them the respect of everyone involved in the Industry.

Mnr. die President, laat my asseblief toe om die Aangewese President, mnr. Piet Botes, in besonder geluk te wens met die goeie program en die hoë standaard van die referate wat hy gereël het vir hierdie Konvensie. Die program belooof om baie interessant en leersaam te wees. Ons is dankbaar vir die referente wat so bereidwilliglik ingewillig het om bydraes te lewer.

Baie dankie ook aan ons personeel van Roodepoort wat die organisasie op hul geneem het.

Dit is voorwaar 'n voorreg vir die Stad Roodepoort om u gasheer te wees. Die Stadsraad van Roodepoort het alles in sy vermoë gedoen om u besoek so aangenaam en genotvol as moontlik te maak. Ons waardeer dit dat mnr. A. R. Hough, Besturende Direkteur van Total S.A. (Edms) Bpk., ingewillig het om die Konvensie te open. Ek twyfel vir geen oomblik dat hy vir ons almal 'n duidelike boodskap gaan bring nie.

Mnr. die President, my samewerking met u was te alle tye van die hartlikste. U is 'n begaafde leier. U het die VMEO se naam hoog gehou en 'n baie hoë standaard gestel. Ek glo dat ons almal u voorbeeld en inspirasie altyd sal wil navolg.

Mr. President, as a token of my appreciation of your wonderful cooperation and the fact that I enjoyed working in close collaboration with you, I now have much pleasure in presenting you with a pair of cufflinks, commemorating the attainment of City status by Roodepoort.

En nou Meneer die President, dames en here, wens ek u almal nogmaals baie hartlik welkom en spreek die vertroue uit dat u 'n baie geslaagde Konvensie sal hê.

Dit is dan vir my 'n voorreg en eer om die 46ste Konvensie van die VMEO amptelik oop te verklaar.

It is my privilege and honour to declare the 46th Convention of the AMEU officially open.

Clr. Bennie van der Walt, Mayor of Roodepoort, presents Mr. Ken Robson with a pair of cuff-links.

MNR. K. G. ROBSON (PRESIDENT)

Meneer die Burgemeester, baie dankie vir u welwillende en vriendelike verwelkoming en vir die reëlings wat vir afgevaardigdes en hulle gades getref is. Ons sal ongetwyfeld 'n wonderlike tydjie saam hierdeurbring.

U het vandag u eie unieke bydrae tot die roemryke geskiedenis van die VMEO gelewer, deur ons in u hoedanigheid van Burgemeester van die gasheerstad welkom te heet — by 'n Konvensie van 'n Vereniging waarvan u 'n gewilde en bekwame Sekretaris is. Ons vereer u in u dubbele hoedanigheid.

Hpwever, this has presented to me a very real problem, because it is not quite fitting for me to hand you an AMEU tie! So therefore, I am happy to be able to present to you, as a special memento of this occasion a plaque of the City of East London with the good wishes of your friend the Mayor of East London, Crl. Elsabe Kemp, and as a mark of my affection.

Mnr. die Burgemeester, gaste, dames en here,

Ons geëerde gas vandag is mnr. A. R. Hough, Besturende Direkteur van Total (S.A.) (Edms) Beperk, wat so vriendelik was om die uitnodiging te aanvaar om hierdie 46ste Konvensie van die VMEO amptelik te open.

Mnr. Alphonzo Richard Hough is op 27 Januarie 1924 op Calvinia, KP., gebore. Na skoolopleiding by die Hoërskool Charlie Hofmeyr, Ceres, behaal hy die graad B.Com. aan die Universiteit van Pretoria, met verdere studie by die Universiteite van Suid-Afrika en Stanford, Californië.

Vanaf 1943 tot 1952 was hy in die kantoor van die Kontroleur en Ouditeur-Generaal; vanaf 1952 tot 1954 in die Departement van Handel en Nywerheid; en vir die tydperk 1954 tot 1956 in die diens van die Suid-Afrikaanse Wolraad.

In Maart 1956 sluit hy by Total Suid-Afrika (Edms) Beperk aan as marknavorsingsbeampte en na bevordering is hy in Januarie 1971 aangestel as Besturende Direkteur van die Maatskappy en direkteur van Total Rhodesië, NATREF en SAFOR.

In Januarie 1974 is hy aangestel as Besturende Direkteur van beide Total Suid-Afrika (Edms) Beperk en Total Raffinering (Edms) Beperk.

In sy buitemuurse bedrywighede is mnr. Hough 'n lid van 'n hele aantal rade en bestuurskomitees, ingeslote die Johannesburgse Hospitaalraad, die Johannesburg en Joubert Park Tegniese Kolleges, die Frances Vorwerg Skool vir Serebraal Verlamde Kinders, die Johannesburgse Boerevereniging, die Witwatersrandse Landbougenootskap en die S.A. Natuurstigting.

Mnr. die Burgemeester, dames en here ek vra nou mnr. Hough om sy Openingsrede te lewer.

Mr. A. R. Hough delivering his opening address to the Convention.

Openingsrede deur A. R. HOUGH Besturende Direkteur van TOTAL Suid-Afrika (Edms) Bpk.

Opening address by A. R. HOUGH Managing Director of TOTAL South Africa (Pty) Ltd.

DIE INTERNASIONALE POLITIEK-EKONOMIESE INVLOEDE OP DIE ENERGIEBELEID VAN SUIDELIKE AFRIKA

THE INTERNATIONAL POLITICO-ECONOMIC INFLUENCES ON THE ENERGY POLICY OF SOUTHERN AFRICA

Mnr. die President, Hooggeplaaste Gaste, Dames en here . . .

Dit is vir my 'n groot voorreg om voor so 'n uitgelese gehoor as gasspreker op te tree. Ek wil graag glo dat my optrede hier binne die raamwerk van u doelstellings val, naamlik, om wyer kennismaking en die wisseling van sienswyses te bevorder en om onderwerpe te bespreek wat gemeenskaplike optrede verg.

Met die oog op kontinuiteit van die gedagtegang wil ek graag die eerste deel van my aanbieding hoofsaaklik in Afrikaans doen en die tweede deel hoofsaaklik in Engels.

Ek het hierdie tema gekies omdat ek glo dat die interaksies van die internasionale politiek en die ekonomie nooit onderskat mag word nie. Hierdie twee wetenskappe bepaal die eindbestemming van nasies en Suid-Afrika is geen uitsondering nie.

In hierdie konteks het energie 'n faktor van politieke en ekonomiese manipulasie geword — meesal deur gewetenlose internasionale politici. Wat Suid-Afrika betref word ons land nog verder belas met die politieke vooroordeel waarna later breedvoeriger verwys sal word.

Ons moet ons versoen met die feit dat ons in Afrika woon en derhalwe beïnvloed die politieke en ekonomiese lotgevalle van ander Afrika-lande ook ons eindbestemming.

Ek stel my tema aan u sonder die minste begeerte om die koninkryk van die politiek te betree.

1. INLEIDING

— Die internasionale oliekrisis het die wêreld se afhanklikheid van olie as energiebron en die gevaar van afhanklikheid van 'n klein groepie hoofverskaffers — die Arabiere — opnuut beklemtoon. Die gebeure in Iran oor die afgelope paar maande het hierdie punt nog verder onderskryf. Afgesien van die politieke vooroordele teen Suid-Afrika het die ekonomiese onewewigtigheid in die energie voorsienings patroon sy nadelige gevolge op Suid-Afrika.

— Oor die volgende 40 tot 50 jaar kan die petroleumreserwes van die wêreld heeltemal uitgeput raak. Binne 10 jaar kan ons reeds tekorte verwag. Voordat dit gebeur sal alternatiewe energiebronne gevind en ontwikkel moet word.

— Die doeltreffende gebruik van beskikbare energiebronne is baie belangrik, want hierdeur kan tyd gekoop word vir die ontwikkeling van alternatiewe bronne. Energiebesparing kan in werklikheid as 'n bron van energie beskou word.

— 'n Nuwe strategie — 'n **"strategie van energie onafhanklikheid"** om genoegsame energievloei vir die toekoms te verseker, moet geformuleer word. Hierdie weg tot energie onafhanklikheid sal Suid-Afrika heelwaarskynlik alleen moet bewandel.

— Die Russe is besig om meesters van die oliemark te word. As u na 'n wêreldkaart sou kyk, sal u sien hoe die Sowjet-unie alreeds sy pionne al langs die wêreld se olieroetes geplaas het.

— Behalwe gebeure in ander dele van die wêreld, is die politieke situasie in Suider-Afrika van so 'n aard dat ons in die Republiek van Suid-Afrika onophoudelik moet werk aan alternatiewe energiebronne terwyl ons ook moet strewe na die maksimum benutting van die energiebronne reeds tot ons beskikking.

— Munisipaliteite is nie alleen groot verbruikers van energie nie, maar ook bemarkers en kan daarom 'n groot rol speel in die uitvoering van 'n energiebeleid.

— In 1974 het ek voorsien dat die oliekrisis skokgolwe vir die volgende dekades deur die ekonomieë van nasies sal stuur. Min kon ek dink dat die skokgolwe die huidige afmetings sou aanneem. As huidige tendense 'n aanduiding is, dan kan die huidige oliekrisis tot 'n totale internasionale ekonomiese insinking lei, tensy nywerheidslande alternatiewe bronne ontwikkel en effektiewe besparingsmaatreëls in werking stel.

2. DIE INTERNASIONALE POLITIEKE SITUASIE

Beheer oor die olieroetes is deel van Rusland se strategie wat moet lei tot wêreldoorheersing. Die Sowjet-Unie is die wêreld se grootste produsent van ru-olie en kan sy posisie in toekomstige konflikte onaanvegbaar maak indien hy die wêreld se olieroetes beheer.

Op die volgende strategiese plekke is Rusland reeds goed ingegrawe of het hy sy oog op:

— Hy is reeds ingegrawe in Aden en Somalië op die drumpel van die Rooi-See en die ingang tot die Suezkanaal.

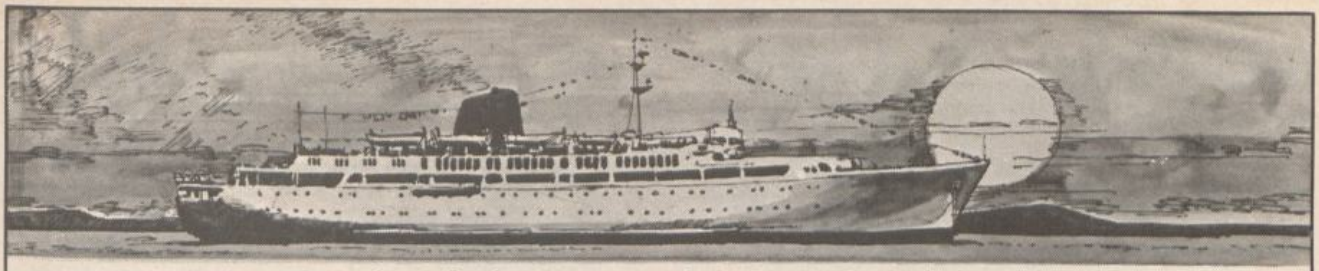
— Ingegrawe in Mosambiek en Angola en kyk met begerige oë na Suid-Afrika om sodoende beheer oor die seeroete om die Kaap te verkry.

— Die onrus in Iran en Libanon is ideale situasies wat Rusland vir eie gewin uitbuit.

Die balans tussen vraag en aanbod van ru-olie kan baie maklik deur politieke gebeure versteur word soos die onlangse gebeure in Iran bewys het.

Alhoewel Israel en Egipte op die drumpel van "sogenaamde" vrede staan, is die situasie steeds plofbaar en kan daar enige tyd 'n herhaling van 1973 se gebeure kom. Ná die afgelope week se nuus uit Iran, twyfel 'n mens of daardie vrede so naby is.

Die houding van Amerika, die vredemaker, die kampvegter van mense-

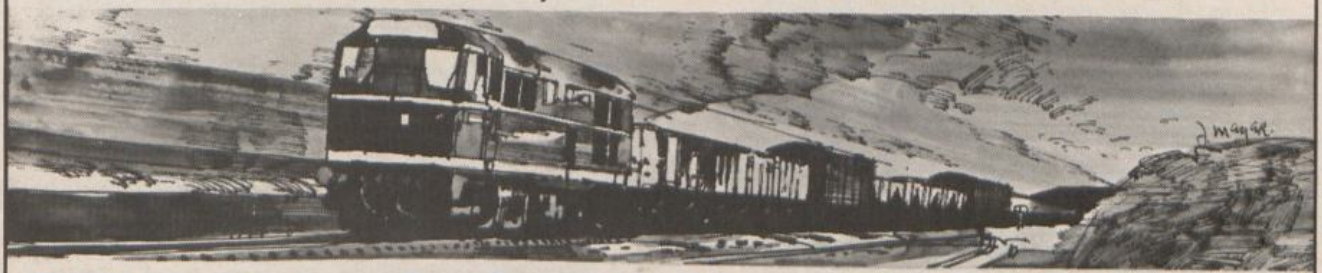


Suid-Afrika is 'n ryk nywerheidsland

wat elke dag sterker word.

In elke stadium, in elke vertakking van die

Suid-Afrikaanse nywerheidswese sal u Total vind.



TOTAL. Die brandstof met dryfkrag en die olie wat beskerm.

TOTAL

LINTAS TL10679/FP

regte in die Iranse konflik verstom 'n mens. Sy het haar steun toegesê aan elke nuwe bewindhebber in Iran. Sy betuig ook roubeklag teenoor die slagoffers van die vernietigers van menseregte. Amerika se buitelandse beleid word uitsluitlik op energie geformuleer. Hoe kan 'n mens boekhou met sulke ruggraatloosheid?

Suid-Afrika het tradisioneel hierdie groot westerse moondheid sowel as ander westerse lande as sy vriende en bondgenote aanvaar. 'n Mens wonder vandag of dit nie wyser sou wees om na oorlewing te streef in 'n vreedsame onderhandeling met 'n mens se vyande nie eerder as om ondergang te soek in 'n koue oorlog met 'n mens se vriende.

Die westerse wêreld is knaend besig om brûe te bou waarmee armoede in een deel van die wêreld verbind word met ellende in ander wêrelddele.

To avoid any misunderstanding, may I repeat my statement:

Traditionally, South Africa accepted this western super power as well as other western countries as its friends and allies. Today one wonders if it would not be wiser to enter into peaceful negotiations with one's enemies for survival, rather than to enter into warfare with one's friends on a road to destruction. The western world seems to be ceaselessly busy building bridges to join poverty in the one part of the world with misery in another.

3. SUIDER-AFRIKA IN DIE SFEER VAN DIE INTERNASIONALE POLITIEK EN EKONOMIE

3.1 Ten opsigte van die politieke toestand in Suider-Afrika is die volgende van belang:

— Rhodesië is nie veel nader aan 'n skikking as 'n jaar gelede nie en in sekere opsigte het die situasie daar versleg. Suid-Afrika se netelige posisie wat die beskikbaarheid van ru-olie betref, word gesien as 'n geleentheid om die Republiek te dwing om druk op Rhodesië toe te pas.

— Gebeure in Suidwes-Afrika oor die afgelope paar maande was baie bemoedigend en die moontlikheid van 'n verkiesing onder V.V. toesig en daarmee 'n oplossing van die probleem voor die einde van 1979, is baie goed. Probleme in Suidwes-Afrika kan egter lei tot verdere druk op die Weste om toe te gee aan die eise van 'n algemene ekonomiese boikot teen Suid-Afrika.

— Suid-Afrika word ernstig geraak deur die politieke toestand in Iran en onmiddellike stappe word geneem om Iran as 'n voorsiener van ru-olie te vervang.

— Baie van ons buurstate — Mosambiek, Angola, en dies meer beoefen alreeds Marxistiese ideologië. Hulle regverdig hulle ekonomiese mislukkings met politieke ideologieë. Westerse lande wend geen poging aan om hierdie politieke tendense te stuit nie. Inteendeel . . .

— Suid-Afrika voer letterlik 'n oorlog op sy grense met nadelige invloede op politieke en ekonomiese gebied.

— Westerse druk op Suid-Afrika om interne politieke veranderinge te bewerkstellig, bemoeilik beplanning deur 'n andersins stabiele plaaslike regering.

3.2 Ten opsigte van ekonomiese toestande in Suider-Afrika is die volgende van belang:

— Die afhanklikheid van Botswana, Swaziland, Lesotho en ander buurstate op die Suid-Afrikaanse ekonomie en infrastruktuur.

— Die strategiese belangrikheid van Suid-Afrika se minerale bronne

- Suid-Afrika hou 86 persent van die wêreld se platinumreserwes. Maar tans het Bophuthatswana jurisdiksie oor 'n groot gedeelte daarvan.
- 83 persent van die wêreld se chroomreserwes.
- 64 persent van die wêreld se vanadiumreserwes.
- 49 persent van die wêreld se goudreserwes.
- 48 persent van die wêreld se mangaanerts.
- 46 persent van die wêreld se vloeispaat (fluorspar).
- 17 persent van die wêreld se uraanreserwes.

(Die nuwe opkomende state in Suid-Afrika sal natuurlik beheer oor sommige van hierdie rykdomme bekom.)

Suid-Afrika se minerale rykdomme tesame met dié van Sowjet Rusland kan die grondslag vorm van 'n magtige ekonomiese alliansie tussen Suid-Afrika en Rusland **teen** westerse nywerheidslande. Die strategiese waarde van hierdie minerale vir nywerheidslande is natuurlik onskatbaar, maar om dit as 'n politieke hefboom teen hulle te gebruik, word nog nie beoefen nie.

— Suid-Afrika se betalingsbalans het fenomenaal verbeter gedurende die afgelope 2 jaar, hoofsaaklik vanweë suksesvolle uitvoere, die beperking op invoere en die hoër goudprys.

— Die politieke gedragslyn van westerse lande het verreikende gevolge op die ekonomieë van lande in Suidelike Afrika, bv.:

- Kapitaal-uitvloei uit Suid-Afrika met sy gevolglike ekonomiese nadele vir Suid-Afrika asook Botswana, Lesotho en Swaziland.
- Mosambiek, Zambië en Rhodesië het onmeetlike ekonomiese verliese gely as gevolg van die steuring van die vry handel tussen hierdie lande.

In die bogenoemde politieke en ekonomiese klimaat moet ons formules beplan en ontwerp om ononderbroke aan die energiebehoeftes van die land te voorsien. Dit word ontsettend bemoeilik deur die internasionale politieke klimaat, maar ek glo dat Suid-Afrika oor die nodige tegnologiese vaardigheid, grondstowwe en kapitaalkragtigheid beskik om ekonomiese weerbaarheid op te bou om hierdie probleem te bowe te kom.

4. THE ENERGY ENIVERSE

4.1 **Energy Sources:** The following data gives brief information on the magnitude and expected lifetime of the various energy sources:

— *Crude Oil:* On January 1, 1978 — world reserves estimated at 88 345 million metric tons (30 production years) (1977).

— *Natural Gas:* 71 838 thousand million M3 reserves (47 production years) (1977).

— *Coal:* 564 000 million metric tons (150 production years) (1985).

— *Uranium:* 1,8 milion metric tons reserves. The lifetime of these reserves will depend on the wider application of this new form of energy. Uranium sources are not as inexhaustible as is commonly accepted.

4.2 During the next decades a significant shift in energy application will take place e.g. the emphasis moves from oil and natural gas to nuclear fuels.

— As far as crude oil is concerned, recent production increases exceeded the rate of discoveries.

— The contribution of natural gas to total energy requirements depends on the completion of natural gas liquification plants and the completion of pipeline projects which create a measure of uncertainty.

— Coal and nuclear fuels can become increasingly important provided that environmental objectivescan be overcome.

The lead times to develop the respective energy sources vary from 4 to 12 years and are extremely important in the planning of a country's energy programme.

5. THE ENERGY SITUATION IN SOUTH AFRICA

5.1 South Africa's main energy sources are:

— Indigenous coal (76%)

— Imported crude oil (24%)

— Nuclear fuel — only upon completion of the Koeberg Power Station.

The present contribution by other energy sources is still insignificantand only towards the turn of the century can we expect an increased contribution by solar energy and hydro-power.

— The country's coal reserves should last for 120 years and more (at production rate of the year 2000).

— Uranium production should reach 11 250 metric tons in 1980 (350 000 metric tons reserves).

5.2 **Electricity Generation:**

— ESCOM GENERATED —¼% of South Africa's electricity requirements in 1974 (70 986 million kW/hours).

- 97,3% by thermo power stations (37,5 million metric tons coal)

- 2,7% by hydro-power.

— ESCOM sold 94% of its generated electricity in 1977 to the following consumers:

	Million kW.h	% of Total
● Mass Sales (incl. municipalities)	20 453	30,5%
● Direct to Mining Industry	20 139	30,0%
● Direct to Industry	21 575	32,1%
● Transport	3 508	5,2%
● Other	1 450	2,2%

— In 1974 electricity contributed 32,6% to the country's useable energy. This percentage should increase to 35% in 1980, and to 40% in 2000.

— At the turn of the century nuclear power stations should generate 10% of the country's electricity requirements.

5.3 **Municipalities as Energy Consumers:**

— Local Authorities consume 2,1% of the country's total petrol and diesel requirements (or 4% of the total diesel).

— The following interesting information on the application of energy by Local Authorities, is revealed in a study conducted by the Department of Planning:

— Johannesburg's trackless tram fleet used 11,1 million kW.h. electricity, while the occupation factor on these trams was only 32,26% (1973/74 financial year).

- Public bus services of the most important municipalities plus those of three private companies transported 440 million passengers during 1974/75 over a distance of 234 million kilometres and in the process consumed 86,3 million litres of fuel.
  The occupation factor on these buses was 21%.
- Total energy requirements for street lighting in all urban areas was estimated at 466,7 million kW.h. during 1974.

— During 1978 Municipalities sold approximately 24 000 million kW.h electricity which equals 35% of ESCOM's distribution.

— A great number of Municipalities generate their own or additional electricity. Johannesburg, Cape Town and Port Elizabeth also manufacture and distribute gas for domestic and industrial use.

5.4 **Transport** (to emphasise the significance of transportation as a consuming industry.)

— The transport of passengers and goods requires 25% of the world's primary energy supply. More than half of this energy is consumed in urban areas.

— It is imperative that public transport problems and systems be meticulously studied when the lay-out of townships is considered.

— The creation of pedestrian areas in city centres should be favourably considered.

— Public transport systems require far less energy per passenger/kilometer than private passenger cars.

— A rationalisation of the traffic flow in city areas will improve fuel consumption.

— In many instances telecommunications could substitute physical transport.

6. THE FUTURE OF ENERGY

6.1 General

I want to present to you some thoughts on this matter:

— The future of world politics, the future of world economies and the destiny of nations will be determined by questions surrounding energy.

— We must distinguish between artificial and genuine shortages. Up to now we have experienced artificial, politically-inspired shortages — the result of political and economical manipulation by producer countries. Within the next decade the demand for crude oil will exceed the supply. This will result in a genuine and far more serious shortage which will be permanent.

— Although the crude shortage will be permanent, a crisis which may have catastrophic results, can be avoided if:

- meaningful and realistic fuel conservation measures can be introduced; and
- adequate alternative energy sources can be developed.

6.2 **The urgent need for a new energy strategy**

— A new energy strategy must be formulated and implemented to ensure a sufficient flow of energy in the future.

— Why is the need for a new energy strategy so urgent?

- Individual consumers are far too casual about the critical energy situation and governments do not take sufficiently drastic measures to formulate practical plicies.
- Psychological shocks are needed to bring about a change in political and electoral attitudes, so that more realistic energy policies can be adopted by the industrialised countries. For this, strong statemanship is required. (This statement was true until Thursday night (February 22nd). The Honourable, Minister of Economic Affairs, gave us the necessary shock treatment on Friday, February 23rd.)
- Industrialised countries are becoming more and more dependent on oil as an energy source over the medium term, instead of the other way round.
- Because of the slow progress in the development of nuclear power, solar energy and other alternative sources of energy, the contribution derived from these sources will still be significant towards the turn of the century.
- Because of the hopelessly inadequate incentives for exploration of new oil fields. One of the causes of this situation is that the consumer is cushioned against price increases of oil. Generally speaking prices should reflect the actual replacement cost of energy. (The recent price increase is a step in that direction.)

6.3 **A Policy towards energy independence in South Africa**

— South Africa is in the fortunate position that only 24% of its energy needs are satisfied by oil as a primary energy source. The critical factor, however, is that 80% of this oil is used for transportation (including tractors and other mobile machinery).

— **What is South Africa's energy position in the international politico-economic sphere?**

We can summarise as follows:

- South Africa has mineral wealth and a relatively sound economy.
- We depend on imported oil for a relatively small percentage of our energy needs.
- We are politically vulnerable.

— **How important is our political vulnerability?**

Lenin said: "Whoever controls Africa, controls Europe." He died in 1924 and during all these years this truth has not yet dawned on the gutless western nations. There is little hope that they will realise this truth during this century — and we will remain vulnerable.

— We will be forced to concentrate on our own energy problems within our own boundaries, rather than seeking a solution in a politically confused world.

— I predict that we will be independent of foreign energy sources by 1990, if we implement, without delay, a policy for energy independence in South Africa. We have the potential and the technology to achieve this formidable objective.

Such a policy will have to:

- provide for the planned reduction of petroleum energy and a switch to alternate sources;
- provide incentives for the development of new sources.

This objective will never be reached under present circumstances. We can no longer afford to think and act in a fragmental fashion — all efforts, in both the public and private sectors, must be consolidated.

— It is said that the most important characteristic of salt is that it should be salty. By this I mean that it would serve no purpose to suggest solutions that cannot work in practice — neither in politics and economics, nor in the field of energy conservation and new energy sources.

- Suggestions for alternative energy options are bewildering in their variety. Likewise, the options pur forward to conserve fuel.
- Many of these are meaningless because they are impractical or they would irreparably harm the economy of the country.

Let us be realistic z— let our salt be salty!

— **Immediate measures towards energy independence**

- Public transport can provide the biggest single contribution towards fuel conservation. A few years ago we had an underground rail system for Johannesburg on the drawing board. Are we proceeding backwards? By the year 2000, we will have plus/minus 8 million economically active people within a 70 km radius of Johannesburg — i.e. plus/minus 50% of the country's economically active work force.
- Public transport can provide the biggest single contribution towards fuel conservation. A few years ago we had an underground rail system for Johannesburg on the drawing board. Are we proceeding backwards? By the year 2000, we will have plus/minus 8 million economically active people within a 70 km radius of Johannesburg — i.e. plus 50 percent of the country's economically active work force.
- Public transport should be generously subsidised.
- An integrated rail mass transportation system in the PWV area is overdue.
  Have you lately experienced a train journey between Pretoria and Johannesburg?
- Heavy tax penalties should be imposed on motor cars with large engine capacities.
- Petrol sales during the week-ends should be allowed only by means of revenue stamps which could be purchased from any Post Office at an excessive premium.
- The proceeds from extra tax and premiums to be used for subsidising pubkic transport and research into alternative fuels.
- An equalisation of electricity rates between urban and rural areas would result in an enormous switch from diesel engines to electricity on farms. (If a subsidy for diesel fuel for agricultural use is justified, so should it be justified on electricity for agricultural use.)
- The private sector must be encouraged by means of incentives to fully exploit all possibilities of utilising and developing alternative energy sources.
- There is a vast potential in the development of renewable forms of energy such as ethanol. South Africa could become a world leader in this field.
- The potential of solar energy, the wind and water must be exploited.
- Rapid advancement in coal technology is essential and further expansion of SASOL activities appears to be the obvious route.
- After Koeberg Nuclear Power Station — what then? We should avoid exporting valuable nuclear fuel in the form of uranium.
- The energy independence wheel must be set in motion — NOW!

Mr. President, you and your members have been a good audience and in declaring this convention open, I wish you spontaneous participation by members, fruitful deliberations, and God bless you!

MNR. K. G. ROBSON (PRESIDENT)

Mnr. Hough, baie dankie dat u hierdie 46ste Konvensie geopen het, en vir die gedagtes wat u vanoggend aan ons voorgelê het.

Mr. Hough, Mr. Mayor, ladies and gentlemen, one would like to have had more time to study some of the rather frightening statistics that Mr. Hough has laid before us.

I am very sorry that, in accepting our invitation to open this Convention, he was put to su much extra work during the weekend because of the speed of events which have overtaken us.

I found the most challenging part of his address in his thoughts about an overall energy strategy and obviously, in considering an energy strategy, the subject of public transport is of special importance. Unfortunately the service is so bad.

With regard to his comments about subsidies to municipalities, may I share a few thoughts with you about the transport system in Moscow, which obviously is operated as part of a macro economy.

What struck me in particular there, amongst other things, was that there were no parking meters and few motor cars. I am not sure whether that would please Mr. Hough very much! The magnificent underground system, which I believe has operated for about fifteen years at the same price of 5 kopeks (6 cents) a ride, subsidises the overground system, with the less efficient trolley and diesel buses charging 3 kopeks (about 3½ cents) a ride.

I believe the message that Mr. Hough has laid before us this morning is that the old days are gone forever and that we have to accept that as individuals and certainly as Municipal Electrical Engineers we have a significant part to play in the great battle that has to be waged, not only here in S.A. but on the Continent as well. This demands from us, I am sure, personal integrity and the commitment to what we believe is right for this country.

Dankie Mnr. Hough, vir wat u gesê het, ons waardeer dit baie.

Mnr. Hough as 'n blykie van waardering en ons dank wil ons hierdie geskenk in die vorm van twee VMEO dasse aan u oorhandig.

Mr. Ken Robson, outgoing President receives an address from the newly inducted President, Mr. Piet Botes.

INHULDIGING VAN PRESIDENT
INDUCTION OF PRESIDENT

MNR. K. G. ROBSON
(Uittredende President)

Mr. Mayor, Mr. Hough, ladies and gentlemen — I have come now to the end of my two-year term of office as President of the AMEU. These two years have been especially kind to me and, for the rewards of shared leadership, of working together and of new friendships, my gratitude to you all.

I know that the AMEU is in good heart. Down through the years the bonds have been strengthened in a diversity of language, culture, political persuasion and heritage — in the cause of good community government and good engineering — but most surely greater opportunities in a still wider context lie ahead.

My sincerest thanks and appreciation to the President-Elect, Mr. Piet Botes, for his ever willing help and support throughout my term of office.

Two separate expressions of thanks — the first to you Mr. Mayor for the delightful Mayoral Dinner in Roodepoort last night for members of the Executive Council and their ladies and for your contribution this morning. The second to you, Mr. Secretary, and my friend Bennie, for two memorable years of working together — you have given me much.

A simple but most sincere "thank you" to my colleagues and friends — Councillors and engineers — for your support, enthusiastic hard work, encouragement and your commitment.

My particular thanks to my wife, Maureen, for her constant help and her forbearance.

Finally thanks to my own City Council for having made it possible for me to have occupied this high office.

It was indeed a singular honour for which I will always be grateful.

Mnr. die Burgemeester, mnr. Hough, dames en here, — my laaste en aangename plig as President is om nou die nuwe President, Mnr. Piet Botes, Professionele Ingenieur en Elektrotegniese en Werktuigkundige Stadsingenieur van Roodepoort, voor te stel en in te huldig. U ken hom goed, daar is taamlik baie aan hom en 'n mens kan hom nie maklik miskyk nie!

Soos mnr. Eugene Pretorius in 1977 in Oos-Londen voorspel het, is mnr. Piet Botes nou die derde oud-Matie wat met die Presidentskap van die VMEO vereer word. Hy is, interessantheidshalwe, die ses-en-veertigste President in die VMEO se geskiedenis van vier-en-sestig jaar.

Hy het 'n lang en verdienstelike rekord van diens aan die VMEO — hy het in 1959 lid geword en is in 1971 tot die Uitvoerende Raad verkies.

Ek glo dat dit waar is om te sê dat hy sy VMEO diens as 'n uiters belangrike en hoogsbevredigende deel van sy professionele lewe beskou.

Ek en my vrou, Maureen, rig ook 'n toegeneë woord van geluk en goeie wense aan Piet se vrou, Urtney.

En nou, mnr. Botes, is dit my eer en voorreg, namens die VMEO, om u te versoek om op te staan en na vore te kom om die Presidentsampsketting en u Presidentswapen in ontvangs te neem as tasbare bewys van u Presidentskap van die VMEO vir die eersvolgende twee jaar.

Hartlike geluk en God seën u.

MNR. P. J. BOTES (PRESIDENT)

U Agbare die Burgemeester van Roodepoort, rld. Bennie van der Walt, mev. van der Walt, mnr. Hough, mnr. Robson, gaste, dames en here, my innige dank aan u vir die besondere eer om my te verkies as President van hierdie Vereniging. Dit is dan in hierdie oomblik dat ek van my diepe afhanklikheid van my Heer en Hemelse Vader getuig.

Hierdie ketting is swaar en dit dring nou tot my deur die gewigtige taak wat voorlê asook die verantwoordelikheid daaraan verbonde.

Hierdie eer my aangedoen, val saam met die 75ste verjaardag van die Groot Stad Roodepoort. Dit sou vir my onmoontlik gewees het om hierdie amp te aanvaar as ek nie die volle steun van my Raad, die Stadsklerk, my kollegas en baie belangrik die samewerking van lede van my eie personeel gehad het nie. My innige dank dus Agbare Burgemeester, dames en here aan hulle.

My besondere dank aan rld. Hennie Hugo, vir die jarelange ondersteuning en kameraadskap. In besonder wil ek u Agbare Burgemeester bedank vir u hulp en leiding in u dub-bele kapasiteit as Burgemeester van Roodepoort die gasheer, en as Sekretaris van hierdie Vereniging.

Agbare Burgemeester, dames en here ek word vandag nog deur my susters beskuldig dat my moeder my voorgetrek het. Dit is dan vir my 'n besondere voorreg en 'n eer om my Moeder ook vandag by hierdie geleentheid te hê. Ek wil haar bedank vir daardie "groot bedryf", vir al die opofferings wat sy gedoen het en vir al die liefde wat sy altyd so mildelik uitdeel. Baie dankie moeder en ek vertrou dat u die verrigtinge saam met die dames sal geniet.

Aan my vrou Urtney en die kinders kan ek net sê dankie, dankie vir alles.

Daar is ook 'n besondere groep ingenieurs wat 'n groot invloed op my lewe gehad het, wat ook aan die Universiteit van Stellenbosch gestudeer het of verbonde was aan die universiteit. Hierdie besondere groep was verder ook almal leerlinge aan die Hoërskool Vrede, op die dorp met die mooi naam "Vrede" in Noordoos-Vrystaat, wat vanjaar sy 100ste bestaansjaar vier. Hulle is:

Dr. R. L. Straszacker — Erelid van hierdie Vereniging;
Mnr. J. L. Rothman — Bestuurder (Nuwe Werke) EVKOM, wie ook vandag 'n referaat hier sal lewer;
Mnr. F. J. W. Barnard — Bestuurder, Randse en OVS Onderneming en onlangs aangestel as Personeelbestuurder van EVKOM, ook vandag hier teenwoordig;
Mnr. P. P. Pretorius — Hoof van Toets en Kommunikasie, Oos-Transvaalse Onderneming van EVKOM.
Dr. J. F. Kemp — Vise-president van die WNNR.

Hier is ook nog baie meer teenwoordig wat ook van Vrede afkom, byvoorbeeld, Gert Myburgh van Kuruman.

Dit sal waardeer word as Raadslid A. C. van Wyk, Onder-Burgemeester van Vrede ons groete aan die Stadsraad en aan die Hoërskool Vrede sal oordra. Ons wens hulle alle voorspoed toe met die feesvierings hierdie jaar.

My besondere dank aan al my VMEO-vriende en in die besonder al die lede van die Hoëveldtak. My dank ook aan die groot aantal oud-Maties teenwoordig asook twee van my leermeesters, naamlik, dr. R. L. Straszacker en rdl. J. F. Uys van Stellenbosch.

Mnr. Ken Robson wens mnr. Piet Botes geluk met sy inhuldiging as President van die VMEO.

Your Worship the Mayor, guests, ladies and gentlemen — I am greatly honoured to have with us here today Mr. Derek Brown, my predecessor in Roodepoort. I do trust that you will enjoy renewing acquaintances with some of your contemporaries.

I wish to thank Ken Robson, the retiring President, for the nice words he has said about me and for the friendship over the past two years. Ken Robson will be remembered for that memorable convention we enjoyed in East London, for the efficient and professional manner in which he conducted all the meetings he chaired and as an impressive personality. Ken, on behalf of the AMEU, I wish to thank you for your distinguished service so far on the Executive Council.

On behalf of the AMEU, I wish to present to you an address as a token of appreciation for your services.

It reads —

> *"The Association of Municipal Electricity Undertakings of South Africa — Be it known hereby that this Certificate has been presented on behalf of all the members of the Association to KENNETH GORDON ROBSON.*
>
> *Mr. K. G. Robson was President of the Association of Municipal Electricity Undertakings of South Africa for the period 1977—1979, and this certificate is a token of appreciation of his particular and loyal services during that period in furthering the objects of the Association."*

Ken, I am sure that this address will occupy a place of honour in your home or office.

VERKIESING VAN AANGEWESE PRESIDENT
ELECTION OF PRESIDENT ELECT

MNR. J. K. VON AHLFTEN: SPRINGS

Meneer die President, laat my eerstens toe om u hartlik geluk te wens met u verkiesing as President van die VMEO. Dit is vir u kollegas besonder aangenaam om u tot hierdie amp vandag verkies te sien en ek wil die vertroue uitspreek dat dit vir u en vir u gade twee baie aangename en gelukkige jare sal weeš. Ek kan u ook verseker van die volle samewerking en ondersteuning van al u kollegas in die twee jaar wat vir u as President voorlê.

Mr. President, ladies and gentlemen, I consider it an honour indeed to be called upon once again to perform this most pleasant task this morning of proposing the President-Elect of this Association.

Mr. Dennis Frazer, President Elect, addressing the Convention.

Now, the person I have in mind is most suited for this high office as you shall see later on.

Firstly, he has been an engineer member of the Association since 1965.

Secondly, he has served on the Executive Council since he took office as the City Electrical Engineer of one of the largest member undertakings of the AMEU.

Thirdly, he has a very unassuming manner and is known for the thoroughness with which he tackles any job assigned to him.

Finally, he is also very civic minded and apparently likes to see the environment being kept clean.
Now, Mr. President, this last characteristic may present us with a problem as we may have to keep matters above board in the AMEU in future.

May I relate this last characteristic to an amusing incident during our recent AMEU/ECA/Department of Labour study tour overseas on the investigation of new wiring systems in which I had the privilege to take part.

As it happened we had completed our official business in Liverpool on a Friday and our next appointment on the following Monday gave us a weekend to spare and it was decided to motor through the lovely Welsh countryside. Incidentally Mr. President, we had the opportunity of having dinner in Chester on the Friday evening with an old friend of the AMEU, namely David Booth, formerly of Scottish Cables in Pietermaritzburg, who is now occupying a senior position with the BICC group in the U.K.

We duly set off on our journey the next morning and, after having experienced some real Welsh hospitality in quite a few pubs on the Welsh coast, our appetites had naturally been stimulated and it was decided to try some local fish and chips. Our civic minded friend duly deposited the wrapper under the front seat of our vehicle, obviously with the idea of depositing it later in some suitable refuse bin. Also, being a bit of a dreamer, he forgot this wrapper. Needless to say, being summer in the U.K. at the time, the aroma arising from our vehicle later the next morning was not to be recommended.

After a frantic search, the wrapper was eventually discovered and following some leg pulling, our civic minded AMEU member of the delegation was duly forgiven by all concerned.

Later during the morning we arrived at a most delightful spot known as the White Swallow Falls, and we promptly departed from our vehicle to admire the view. Again, needless to say, our litter conscious friend observed a piece of tissue paper laying next to our vehicle and he promptly deposited this on the front passenger seat, obviously with the idea of again depositing it in some refuse container later on.

As it happened, one of the ECA members observed this suspicious looking wrapper on the front seat and in no uncertain manner took hold of it to redeposit it where it had come from, having not forgotten his experience earlier on with the delayed action of the fish wrapping.

To his surprise however, the contents of this wrapper bore no resemblance to fish whatsoever, but in fact was associated with what comes naturally to our canine friends! You may well imagine the remarks, which cannot be repeated here, from the ECA and the deathly silence from the AMEU member.

I can assure you Mr. President, it took some persuation after this incident to convince the ECA to handle any piece of paper associated with the AMEU. I might add that the person I am speaking of was fortunate that the Chief Inspector of Factories had been unable to accompany us on our weekend excursion, otherwise he may well have been charged under the Factories Act for contravening Regulation B 5 (1) which clearly states that "PREMISES WHICH BY DEFINITION ALSO INCLUDES A VEHICLE SHALL BE KEPT FREE FROM ANY SMELLS ARISING FROM ANY CAUSE WHATSOEVER."

Mr. President, Ladies and Gentlemen, I think by now it is pretty obvious whom I have in mind as President-Elect of the AMEU — namely, Dennis Fraser, the City Electrical Engineer of Durban — and I do not think he needs any further introduction.

It, therefore, gives me great pleasure in formally proposing Dennis Fraser as President-Elect and may I on your behalf extend our good wishes to him and his good lady, Val, for a very successful term of office.

MR. K. G. ROBSON (East London)

Mr. President, Mr. Mayor, ladies and gentlemen, the city of Durban last provided the AMEU with its President as far back as 1960. Therefore, the nomination of the City Electrical Engineer of Durban, Mr. Dennis Harvey Fraser, as President-Elect to take office in 1981 — twenty-one years later — underscores the fact that the honour of this high office does not come easily and is not lightly conferred.

I have been privileged to have known and been associated with Dennis since 1971 — the year in which he was elected to the Executive Council — and my life has been enriched by his friendship and example.

An Electrical Engineer of recognised ability and professional standing in South Africa, he is a man of fine qualities, integrity, dignity, kindliness, loyalty — a man of Christian conviction and commitment.

I most certainly am no admirer of Richard Nixon, but these words he spoke to David Frost in that famous TV interview and recorded by David Frost in his book "I gave them a Sword", profoundly impressed me when first I read them:

> "Generally speaking in politics and in life generally, as a rule . . . you will find some people are competent but not loyal. Other people are loyal but not competent, and when you find one that is both competent and loyal you've found the rarest of gems".

Mr. President, I believe that for the AMEU and its members Dennis Fraser is one such "rarest of gems".

Accordingly it is with great pleasure that I second Mr. von Ahlften's proposal.

MNR. P. J. BOTES (President)

Dennis Fraser has been nominated for the office of President Elect. Any further nominations . . . ?

As there are no further nominations it gives me great pleasure to announce Dennis Fraser unanimously elected as President-Elect. My congratulations Dannis.

MR. D. H. FRASER (President-Elect)

Your Worship the Mayor, Mr. President, honoured guests, ladies and gentlemen,

Meneer die President, waar u tot die hoogste amp in ons Vereniging verkies is, bied ek u graag my gelukwense aan, en namens al sy lede wens ek u alle heil en seën toe, gedurende u tweejaar ampstermyn.

Ek weet dat u baie pligte opgelê word en dat die verantwoordelikheid wat u sal moet dra, inderdaad groot sal wees, maar dit weet ek ook — u sal altyd op u vriende en kollegas kan reken, want dit sal vir hulle 'n groot eer en voorreg wees om bystand aan u te verleen en u aan te spoor en te bemoedig.

I am deeply conscious of the honour bestowed on me by the members of the AMEU in choosing me to be their President-Elect for 1979/81. Thank you Jules for your kind remarks in proposing me for the position and for not disclosing all you found out about me during our overseas trip last year. For a small consideration I may be persuaded to withhold for a while longer revealing some of your less well-known nocturnal accomplishments and stop publication of the second part of our report,

which goes into some detail on other "systems" and "techniques" in use in certain European countries, which you studied in some depth. My grateful thanks to you too, Ken, for your warmth and sincerety in seconding the proposal. You have guided the Association with dignity and wisdom during the past two years and set an example which your successors in office will find difficult to live up to. I am reassured by the knowledge that you will still be around to advise and encourage in the years ahead.

The distinction of having its Electrical Engineer appointed President-Elect was last conferred upon Durban in 1959 when my predecessor, Mr. Ronald Simpson, who is with us today, was elected. I am sure that I can say on behalf of my Council, that Durban welcomes the continuing involvement in the affairs of the AMEU and the important work which the Association does in the interests of all Municipalities in the Republic.

Mr. President, having accepted the office of President-Elect, I offer you my personal support and loyalty and will endeavour with God's help and with the aid of my "tweetalige" wife, Val, to serve the AMEU to the best of my ability.

MR. P. J. BOTES, President:

Ladies and Gentlemen, I will now ask Mr. Fraser to take charge of the meeting while I deliver the Presidential Address.

MR. D. H. FRASER, President-Elect:

Without further ado I'll ask our President to proceed with the Presidential Address:

PRESIDENTSREDE

deur Mnr. PIET BOTES
B.Sc (Ing.) Pr. (Ing.) GSAIEI

1. INLEIDING — DUUR VAN KONVENSIE

1.1 In oorleg met die verklaarde beleid van die Verenigde Munisipale Bestuur van Suid-Afrika, is daar besluit om die duur van hierdie konvensie tot drie dae te beperk. Ons betree dus weer 'n nuwe tydperk in die geskiedenis van die V.M.E.O. en die gewone "middag-af" word uitgeskakel.

1.2 Die tyd tot ons beskikking moet dus so doeltreffend moontlik aangewend word en met u samewerking om besprekings kernagtig te maak, en deur te poog om herhalings te vermy, sal ons binne die tydsbestek van die program kan bly. Dit is om hierdie rede dat referente versoek is om hulle bydraes nie te lees nie, maar eerder net die kerngedagtes toe te lig. Bydraes moet beperk word tot 'n maksimum tydperk van tien minute en gevolglik is gereël dat 'n stelsel van waarskuligte vir my gerief, aangebring is en om u te help om binne die perke te bly. Ek moet hier meld dat die V.M.B. onder andere, verder aanbeveel het dat 'n presensielys vir elke dag van die konvensie gehou word. Daar sal dus 'n presensielys elke oggend by die inligtingsdiens beskikbaar wees. Ingenieurs- en Raadslede moet dus self seker maak dat hulle elke dag aanteken. Dit sal nie prakties wees om die presensielys elke dag om te stuur nie.

2. DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS VAN SUID-AFRIKA — DIE TOEKOMS

2.1 Die keuse van 'n onderwerp vir my presidentsrede is vergemaklik deur 'n eertydse versoek van mnr. G. C. Theron, erelid van hierdie Vereniging, aan die Uitvoerende Bestuur om 'n skrywe oor die doen en late van die V.M.E.O. en in besonder die toekoms van die V.M.E.O. die lig te laat sien. Dit is dan ook nou gepas om by hierdie geleentheid mnr. Theron te bedank vir sy toegewyde en onbaatsugtige diens wat hy aan die V.M.E.O. gelewer het. Dit is vandag sy tweede laaste dag in diens van die Munisipaliteit van Vanderbijlpark en ons sal môre-aand in Roodepoort op gepaste wyse van mnr. Theron en sy gade afskeid neem.

3. SUID-AFRIKAANSE BURO VAN STANDAARDE — INTERNASIONALE ELEKTROTEGNIESE KOMMISSSIE-VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS VAN SUID-AFRIKA: GESKIEDENIS

3.1 Daar bestaan 'n hegte band tussen die Vereniging van Munisipale Elektrisiteitsondernemings van Suid-Afrika en die Buro van Standaarde, en deur die S.A.B.S. met die Internasionale Elektrotegniese Kommissie. Om die verwantskap duidelik te omskryf, is ek genoodsaak om baie kortliks die geskiedenis van die Buro van Standaarde en die I.E.K. te skets, asook hulle verwantskap met die V.M.E.O.

3.2 *Suid-Afrikaanse Buro van Standaarde*
Die noodsaaklikheid dat 'n komitee aangestel behoort te word om die standaardisering van masjinerie en ander materiale te oorweeg, is reeds sover terug as 1905 deur verskeie instansies bepleit.

Die eerste vergadering van die "Committee of Standardization of South Africa Materials", wat saamgestel was deur die "Transvaal Institution of Engineers" is in Augustus 1909 gehou.

In 1911 verander die naam van die komitee na "South African Engineering Standards Committee", wat later dien as die Suid-Afrikaanse tak van die "British Engineering Association".

Eers in 1934 erken die Regering hierdie instansie as die Standaardiseringsliggaam van die Unie van Suid-Afrika. Dit word genoem die "South African Standards Institution" met die hoofdoel om die pogings van vervaardigers en verbruikers vir die verbetering en standaardisering van ingenieurs- en industriële toerusting te koördineer.

Eers in 1945 met die goedkeuring van die Wet op Standaarde, Wet nr. 24 van 1945, is die Suid-Afrikaanse Buro van Standaarde gestig, en beheer deur 'n spesiale Raad, aangestel deur die Minister van Ekonomiese Sake, en staan bekend as die Raad van Die Suid-Afrikaanse Buro van Standaarde.

3.3 *V.M.E.O.-verwantskap*
Gedurende die vierde jaarlikse konvensie van die Vereniging van Munisipale Elektrotegniese Ingenieurs gehou in Septem-

PRESIDENTIAL ADDRESS

by Mr PIET BOTES
B.Sc (Eng.) Pr. (Eng.) FSAIEE

1. INTRODUCTION — DURATION OF CONVENTION

1.1 According to the declared policy of the United Municipal Executive of South Africa it has been decided to limit the duration of this convention to three days. So once again we are entering a new era in the AMEU and the usual "free afternoon" is eliminated.

1.2 The time at our disposal must therefore be utilised as efficiently as possible and with your co-operation we will try to keep discussion periods pertinent, and to avoid repetition. It is hoped that then we will be able to get through the programme in the time allotted. It is for this reason that speakers have been requested not to read their papers but rather to highlight points of prime importance. Contributions must be limited to a maximum of 10 minutes and a warning light system has been devised to help you keep yo your time limit. I would also like to make mention of the fact that the UME, inter alia, further recommended that an attendance register be kept for every convention day. To this end such a register will be made available at the information service desk every morning. Engineer and Council members must please ensure that they sign in every day, as it would not be practical to circulate the register.

2. THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTH AFRICA — THE FUTURE

2.1 The choice of a subject for my presidential address was facilitated by a remark made some time ago by Mr G. C. Theron, honorary member of the Association, when he suggested that the Executive publish a paper on the AMEU itself and in particular, its future. It is therefore fitting for me to thank Mr Theron on this occasion, for the dedicated and unselfish service he has rendered the AMEU. Today is his second last day in the service of the Vanderbijlpark Municipality and tomorrow evening in Roodepoort we will take leave of Mr Theron and his wife in the appropriate manner.

3. SOUTH AFRICAN BUREAU OF STANDARDS — INTERNATIONAL ELECTRICAL COMMISSION — ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTH AFRICA: HISTORY

3.1 There are close ties between the AMEU of South Africa and the SABS, and through the latter between the AMEU and the IEC. In order to clearly delineate the relationship I must briefly sketch the history of the Bureau of Standards and the IEC, as well as their relationship to the AMEU.

3.2 *South African Bureau of Standards*
As early as 1905 the need for the appointment of a committee to consider the standardisation of machinery and other materials was put forward by various organisations.

The first meeting of the "Committee of Standardization of South African Materials", which was set up by the "Transvaal Institution of Engineers' was held in August 1909.

In 1911 the name of the committee changed to "South African Engineering Standards Committee", which later served as the S.A. branch of the "British Engineering Association".

It was only in 1934 that this body was recognised by the Government as the Standardisation body in the Union of South Africa. It was called the "South African Standards Institution" and had as its main objective the co-ordination of the attempts by producers and consumers to improve and standardise engineering and industrial equipment.

Then in 1945, following the approval of the Standards Act, Act No. 24 of 1945, the South African Bureau of Standards was established and controlled by a special Board appointed by the Minister of Economic Affairs and known as the Board of the South African Bureau of Standards.

3.3 *AMEU Relationship*
At the fourth annual convention of the AMEU, held in September 1920, Mr. B. Sankey was appointed representative

ber 1920, is mnr. B. Sankey aangewys as verteenwoordiger op die Suid-Afrikaanse tak van die "British Engineering Association".

Dit is blykbaar die eerste verbintenis wat daar ontstaan het. Dit is interessant om daarop te let dat die eerste verslag aan kongresgangers gedurende die vyfde jaarlikse konvensie, gehou in November 1922, die aanvaarding van die volgende standaarde vir elektriese voorsiening in Suid-Afrika, aanbeveel word, nl.:

"Direct Current: 3-wire 240/480 delivered voltages."
"Alternating Current: 3-phase, 50 cycles, 4 wire.
240 volts between Neutral and Phases and
415 volts between phases".
"Distributing or Transmitting Pressures: 3 300—6 600 and
11 000 volts".

Tydens die 19de konvensie van die Vereniging van Munisipale Elektrisiteitsondernemings gehou in Rhodesië gedurende Mei 1945, was daar heelwat verskil van opinie in die geledere van die V.M.E.O. oor die beoogde wetgewing (Wet op Standaarde) wat in dieselfde jaar deur die Parlement goedgekeur sou word, en het hulle die volgende skrywe aan die betrokke Minister gerig op aandrang van Raadslid Ferry van Kaapstad:

"Whereas this Association of Municipal Electricity Undertakings of the Union of South Africa and Rhodesia at the proceedings of the Nineteenth Convention assembled in Salisbury, Rhodesia, May, 1945, is greatly concerned by the legislation evident in the proposed Standards Act 1945 which we consider will have a tendency to give dictatorial powers to civil servants and semi-Government bodies such as the proposed Council, therefore the Convention urges in the interests of all concerned that the Bill be referred to a Select Committee".

So erg was die gevoel dat daar gepraat is van "fascist legislation".

Gedurende die daaropvolgende konvensie is geen woord gerep oor hierdie besluit nie; onder die uitgenooide gaste van die 21ste konvensie in 1947 was mnr. J. Ritchie, Direkteur van die Buro van Standaarde. Daarin verskyn ook die eerste vorderingsverslag oor die werksaamhede van die S.A.B.S.

3.4 *Internasionale Elektrotegniese Kommissie*
Die Elektriese Ingenieurswese was een van die eerste organisasies om 'n internasionale kongres te organiseer wat in 1881 in Parys gehou is. In 'n daaropvolgende kongres wat in St. Louis (VSA) in 1904 gehou is, is die volgende besluit aanvaar:

"that steps should be taken to secure the co-operation of the technical societies of the world by the appointment of a representative commission to consider the question of the standardisation of the nomenclature and ratings of electrical apparatus and machinery".

Tydens die voorlopige vergaderings wat in Londen gehou was op 26 en 27 Junie 1906, is die Internasionale Elektrotegniese Kommissie (I.E.K.) gebore.

Lord Balfour wat die eerste Raadsvergadering van die I.E.K. bygewoon het, het die rigting probeer aandui deur die taak voor enige internasionale geskille te probeer plaas. Lord Balfour sal in Suid-Afrika onthou word vir sy bevel aan Sir Redvers Buller "relieve Ladysmith or resign", en sy ondersteuning van die idee om die tekort aan werkers op die myne aan te vul met die invoer van Chinese arbeiders.

Mnr. Lee Murray was die verteenwoordiger van Suid-Afrika op die eerste Raadsvergadering van die I.E.K.

Op 11 Mei 1917 is die "Electrical Sub-committee of the South African Engineering Standards Committee" gestig, en is die Vereniging van Munisipale Elektriese Ingenieurs verteenwoordig deur die here E. T. Price, T. E. Molley-Dod en J. Roberts. Hierdie komitee wat later twee keer van naam verander het, net as basis gedien vir kommunikasie met die I.E.K. tot en met die tweede wêreldoorlog. Eers in 1918 het die Minister van Handel en Nywerheid toestemming verleen dat Suid-Afrika 'n lid van die I.E.K. word, en deur die "South African Standards Institute" verteenwoordig sou word. As gevolg hiervan het dr. Bernard Price die Raadsvergadering van die I.E.K. op 28 Junie 1938, wat in Torquay gehou was, bygewoon.
In 1947 het die Suid-Afrikaanse Buro van Standaarde oorgeneem. Die huidige president van die Nasionale Komitee is mnr. A. A. Middlecote, 'n erelid van hierdie vereniging.

to the South African Branch of the "British Engineering Association". It seems that this was the first point of contact. It is interesting to note that the first report to delegates attending the fifth annual convention held in November 1922, recommended the acceptance of the following standards for the supply of electricity in South Africa, namely:

"Direct Current: 3-wire 240/480 delivered voltages."
"Alternating Current: 3-phase, 50 cycles, 4-wire.
240 volts between Neutral and Phases and
415 volts between phases."
Distributing or Transmitting Pressures: 3 300—6 600 and
11 000 volts".

During AMEU's 19th convention held in Rhodesia in May 1945, there was a considerate difference of opinion amongst members in respect of the proposed legislation (Standards Act) which was to be approved by Parliament that same year, and the following statement was addressed to the Minister concerned at the insistence of Councillor Ferry of Cape Town:

"Whereas this Association of Municipal Electricity Undertakings of the Union of South Africa and Rhodesia at the proceedings of the Nineteenth Convention in Salisbury, Rhodesia, May 1945, is greatly concerned by the legislation evident in the proposed Standards Act 1945, which we consider will have a tendency to give dictatorial powers to civil servants and semi-Government bodies such as the proposed Council, therefore the Convention urges in the interests of all concerned that the Bill be referred to a Select Committee".

Feeling ran so high that there was even talk of "fascist legislation".

At the next convention no mention was made of this decision and among the invited guests at the 21st convention in 1947 was Mr. J. Ritchie, Director of the Bureau of Standards. The first progress report of the activities of the SABS was also delivered at that convention.

3.4 *International Electrical Commission*
The electrical engineering industry was one of the first organisations to convene an international congress — and this was held in 1881 in Paris. At a subsequent congress in St. Louis (USA) in 1904, the following decision was accepted:

"that steps should be taken to secure the co-operation of the technical societies of the world by the appointment of a representative commission to consider the question of the standardisation of the nomenclature and ratings of electrical apparatus and machinery".

During the course of the preliminary meetings held in London on the 26th and 27th of June 1906, the International Electrical Commission (IEC) was brought into being.

Lord Balfour, who attended the first Council meeting of the IEC, tried to indicate the direction the body should take by suggesting that the task at hand be placed above any international differences. He will be remembered in South Africa for his command to Sir Redvers Buller: "relieve Ladysmith or resign" and his support of the idea to supplement the labour shortage on the mines by importing Chinese labourers.

South Africa was represented at the first board meeting of the IEC by Mr Lee Murray.

On the 11th May 1917 the "Electrical Sub-committee of the South African Engineering Standards Committee" was established and the AMEU was represented by Messrs. E. T. Price, T. E. E. Molley-Dod and J. Roberts. This committee which later changed its name twice, served as a basis for communication with the IEC up to and during the second world war. It was only in 1918 that the Minister of Commerce and Industry granted permission for South Africa to become a member of the IEC, and that it be represented by the "South African Standards Institute". As a result of this Dr Bernard Price attended the board meeting of the IEC held in Torquay on 28th June 1938.

In 1947 the South African Bureau of Standards took over and the current president of the National Committee is Mr A. A. Middlecote, an honorary member of this association. On two

Die Suid-Afrikaanse Nasionale Komitee is by twee geleenthede verkies om as een van die 12 lede van die "Committee of Action" (Uitvoerende liggaam van die I.E.K.) te dien, nl. vanaf 1970 tot 1976 en weer in 1978.

Mnr. Middlecote is ook Voorsitter van die belangrike I.E.K. komitee "T.C." 64 "Electrical Installation of Buildings" vanaf 1970, en in 1977 herkies vir 'n verdere drie jaar.

Mnr. G. C. Theron het die I.E.K. vergadering wat in Brussels gehou was gedurende Oktober 1971 bygewoon as lid van die Nasionale Komitee, en so vir die eerste keer die V.M.E.O. verteenwoordig. Sedertdien het die V.M.E.O. verskeie lede as lid van die Nasionale Komitee na I.E.K.-vergadering gestuur.

4. V.M.E.O. VERTEENWOORDIGING OP S.A.B.S.-KOMITEES

4.1 Die Suid-Afrikaanse Buro van Standaarde is uitermate belas met die opstel van standaardspesifikasies en -gebruikskodes. Om hierdie doel te bereik, word tegniese komitees gestig en word lede deur die Raad van die S.A.B.S. aangestel. Op hierdie tegniese komitees dien verteenwoordigers van vervaardigers, verbruikers, navorsingsinstansies, verskaffers van rou materiale en ander instansies wat 'n bydrae tot die onderwerp kan lewer.

4.2 Verskeie instansies word dus deur die S.A.B.S. uitgenooi vir deelname. Dit was vir my 'n groot voorreg om as skakel te dien tussen die V.M.E.O. en die S.A.B.S. vanaf 1971, sover dit die V.M.E.O. verteenwoordiging op tegniese komitees betref. Die V.M.E.O. verteenwoordiging berus by daardie gewillige ingenieurslede van stede of dorpe in die onmiddellike omgewing van Pretoria en Johannesburg. Hierdie diens word gedurende normale werksure verrig en ek wil by hierdie geleentheid die dank van die V.M.E.O. oordra aan dié stadsrade wat oor die jare heen hulle ingenieurs beskikbaar gestel het vir die doel asook die verskaffing van die nodige vervoergeriewe.

4.3 *V.M.E.O. as Verteenwoordiger van die Verbruiker*
Verbruikersinstansies wat belang het by huishoudelike toebehore word ook uitgenooi om op tegniese komitees te dien, maar as gevolg van beperkte kennis van elektrisiteit en probleme om 'n geskikte verteenwoordiger te kry, is daar gewoonlik niemand wat die verbruiker verteenwoordig nie. Ofskoon die V.M.E.O. nie eintlik belang het by standaardspesifikasies vir huishoudelike toebehore, soos bv. strykysters, stofsuiers, yskaste, ensovoorts nie, word gepoog om sover moontlik 'n verteenwoordiger aan te stel wat dus na die verbruiker se belange kan omsien.

4.4 *Ingenieurslid-verteenwoordiger — Toekoms*
Daar moet egter op gelet word dat die vervaardiger 'n spesialis aanstel as sy verteenwoordiger op so 'n tegniese komitee. Die gewillige ingenieurslid met al sy administratiewe verpligtings, moet homself dus instudeer in die onderwerp om enigsins 'n positiewe bydrae te kan maak. Baie belangrike bydraes word gelewer deur ingenieurslede maar ek is bevrees dat hedendaagse administratiewe pligte die ingenieurslid se tyd só in beslag neem dat net sy ondergeskiktes, wat belas is met die eintlike substantiewe werk, as V.M.E.O. verteenwoordiger aangestel behoort te word. Hierdie reëling maak die ingenieurslid vry om sy volle aandag aan sy administratiewe pligte te wy, terwyl die aanstelling van 'n ondergeskikte as verteenwoordiger die voordele inhou dat hy onmiddellik substantiewe kennis van die onderwerp het, en gevolglik in 'n posisie is om homself beter voor te berei. Die tyd asook die geriewe wat tot sy beskikking is, maak van hom die ideale verteenwoordiger.

Hierdie verteenwoordigers behoort oor die hele Suid-Afrika gewerf te word en die V.M.E.O. behoort die betaling van reis- en verblyftoelae te oorweeg. Die S.A.B.S./I.E.K. verteenwoordiger behoort in 'n posisie geplaas te word om onmiddellik sy vinger te kan lê op 'n geskikte verteenwoordiger vir 'n spesifieke taak.

4.5 *Bedradingskode*
Die opstel van die nuwe bedradingskode deur die S.A.B.S. wat die standaardregulasies vir die bedrading van persele gaan vervang, destyds uitgegee deur die S.A. Instituut van Elektrotegniese Ingenieurs, is nou tot die finale beslag deurgevoer. Die kode is die gesamentlike resultaat van die samewerking en bydraes van verskillende instansies. Die V.M.E.O. en die S.A.B.S. kan met trots uitsien na die ingebruikneming van hierdie kode.

Namens u dus, wil ek die V.M.E.O. verteenwoordigers wat oor die jare saamgewerk het, bedank vir die bydraes wat hulle ge-

occasions the South African National Committee was elected to serve as one of the 12 members of the "Committee of Action" (Executive arm of the IEC), namely, from 1970 to 1976 and it was again elected in 1978.

Mr Middlecote has also been chairman of the important IEC "T.C." 64 "Electrical Installation of Buildings" committee since 1970 and in 1977 was re-elected for a further three year period.

Mr. G. C. Theron attended the IEC meeting held in Brussels in October 1971 as a member of the National Committee and the AMEU was therefore represented for the first time. Since then the AMEU has sent various members to IEC meetings as members of the National Committee.

4. AMEU REPRESENTATION ON SABS COMMITTEES

4.1 There is such a demand for the compilation of standards specifications and codes of practice that the SABS has had to establish technical committees with members appointed by the Board of the SABS. Representatives of manufacturers, consumers, research bodies, raw material suppliers and other organisations who can make a contribution to a particular subject, serve on these technical committees.

4.2 So various bodies are invited by the SABS to participate and it has been a great privilege for me to have served as the contact between the AMEU and the SABS since 1971 as regards AMEU representation on technical committees. AMEU representation has always rested on the shoulders of those willing engineer members of towns and cities in the immediate vicinity of Pretoria and Johannesburg. This service is carried out during normal working hours and I would like to use this opportunity to convey the AMEU's thanks to those city councils which have over the years made engineers available for this purpose as well as supplying the necessary transport facilities.

4.3 *AMEU as the Consumer's Representative*
Consumer bodies concerned with domestic appliances are also invited to serve on the technical committees, but as a result of limited knowledge of electricity and the problems of finding a suitable representative, there is usually no one to represent the consumer. Even though the AMEU is not really interested in standard specifications for domestic appliances, such as irons, vacuum cleaners, fridges, etc., an attempt is made to appoint a representative to look after the interests of the consumer.

4.4 *Engineer member — representative — Future*
Care must be taken that the manufacturer appoints a specialist as his representative on a technical committee. The willing engineer, with all his administrative duties, must thoroughly acquaint himself with the subject in order to be in a position to make a positive contribution. Many important contributions are made by engineer members but I am afraid that present day administrative tasks take up so much of the engineer's time that only his subordinates, charged with the actual substantive work, can be appointed as AMEU representatives. This would leave the engineer free to give his full attention to his administrative duties, whilst the appointment of a subordinate as the representative has the advantage that he has immediate knowledge of the subject and is therefore in a position to prepare himself better. The time, as well as the facilities at his disposal, make him an ideal representative.

These representatives should be recruited all over South Africa and the AMEU should consider the payment of travel and subsistence allowances. The SABS/IEC representative should be in a position to designate, at any time, a suitable representative for a specific task.

4.5 *Wiring Code*
The compilation of the SABS's new wiring code which is to replace the standard regulations for the wiring of premises, as published by the South African Institute of Electrical Engineers, is now in its final stage. The code is the joint result of the co-operation and contributions of various bodies. The AMEU and the SABS can look forward to the implementation of this code with pride.

On your behalf therefore I would like to thank all AMEU representatives who have worked together over the years for their contributions, and who at times must have experienced

lewer het, wat by tye onder moeilike persoonlike omstandighede plaasgevind het, asook aan die verteenwoordigers van stede wat so 'n groot bydrae gelewer het. Aan die S.A.B.S. baie dankie en hartlik geluk met 'n welgedane taak.

4.6 *SABS/IEK Koördineerders*
Om die redes soos reeds vermeld, behoort die huidige gebruik van twee S.A.B.S./I.E.K. koördineerders vervang te word deur 'n gekose subkomitee bestaande uit drie lede. Alle aangeleenthede met betrekking tot die S.A.B.S. en I.E.K. sake sal dan deur hierdie komitee behartig word, insluitende die reg om geskikte verteenwoordigers aan te stel, wat op tegniese komitees sal dien.

5. TENDERVOORKEURE

5.1 Voorsiening word in die Ordonnasie op Plaaslike Bestuur van die vier Provinsies gemaak met betrekking tot tendervoorkeure aan plaaslike inhoud. 'n Bykomende voorkeur word toegelaat aan goedere wat oor die S.A.B.S.-merk beskik.

5.2 Op aandrang van die Departement van Nywerheidswese sal daar binnekort nuwe tendervoorkeure vir plaaslike inhoud voorgeskryf word. Die wysiging aan die tendervoorkeure sal algemeen verwelkom word, veral as die volgende aspekte in aanmerking geneem word.

5.3 *Tendervoorkeure aan plaaslike vervaardiging*
In die praktyk gebeur dit soms dat 'n oorsese vervaardiger van sy verouderde toerusting ontslae raak in Suid-Afrika teen 'n baie lae prys bekend as "dumping". Selfs die huidige tendervoorkeure is nie voldoende om hierdie praktyk aan bande te lê nie.

In ander gevalle word plegtig belowe dat die goedere wat die toekenning van die tender bekom, plaaslik vervaardig gaan word maar nadat die bestelling geplaas is, het plaaslike toestande skielik só verander dat daar nie meer met plaaslike vervaardiging voortgegaan kan word nie.

Daar is ook gevalle bekend waar die plaaslike leweransier roofonderdele verkry van lande agter die ystergordyn wat goedkoper is as die onderdele van die oorsese vervaardiger, maar wat van baie swakker gehalte is.

Daar moet kennis geneem word dat die Elektrotegniese Ingenieur die persoon naaste in die hiërargie skakel met die verbruiker en gevolglik is die Ingenieur dus ingestel om die risiko's verbonde aan die gehalte van die goedere te gradeer. Goedere wat aangekoop word vir installering by 'n groot aantal verbruikers, moet waarborg kan toon ten opsigte van die kwaliteit en die lewering van naverkoopdiens. Dit is nie genoegsaam om dit in tenderdokumente te meld nie. Dit is in hierdie verband dus beter dat skakeling tussen Stadselektrotegniese Ingenieurs, Stadsrade, Provinsiale Rade en Regeringsinstansies moet geskied. Wedersydse skakeling en vertroue moet aangekweek word en hierin sien ek 'n baie belangrike rol wat die V.M.E.O. kan vervul.

5.4 *Voorkeur aan goedere met S.A.B.S.-merk*
Die voorkeur wat aan goedere verleen word wat oor die S.A.B.S.-merk beskik, is nie voldoende om die volgende wanpraktyke uit te skakel nie:

5.4.1 Daar is gevalle bekend waar 'n plaaslike owerheid materiaal aangekoop het van oorsese vervaardigers, aangesien die plaaslike vervaardigde artikel, wat oor die S.A.B.S.-merk beskik, baie duurder was. Die werklike feit was egter dat die oorsese produk van 'n uiters lae gehalte was en nie naasteby gelykstaande was aan dié produk wat oor die S.A.B.S.-merk beskik nie.

5.4.2 'n Heffing word deur die Raad van die S.A. Buro van Standaarde geplaas op alle artikels wat die S.A.B.S.-merk dra.

Vervaardigers van artikels wat nie die S.A.B.S.-merk dra nie, maar waarvoor daar wel 'n standaardspesifikasie bestaan, word myns insiens nie aangespoor om die S.A.B.S.-merk te bekom nie, want daar is aan my in soveel woorde gesê dat die heffing en die streng beheer wat ingestel moet word om te verseker dat die artikel aan die vereistes voldoen, die artikel duurder maak.

Het dit dus nie tyd geword dat hierdie heffing geplaas moet word op alle plaaslik-vervaardigde artikels nie, of die spesifieke artikel nou aan die vereistes van die merk voldoen al dan nie. In der waarheid behoort hierdie heffing ook van toepassing te wees op ingevoerde artikels.

Hierdie opmerking het veral betrekking op elektriese

difficult moments in making themselves available. My thanks also to the representatives of cities, who have played such an important part via their contributions. To the SABS as well, thank you and hearty congratulations on a task well done.

4.6 *SABS/IEC Co-ordinators*
To promote liaison the present use of the two SABS/IEC co-ordinators must be replaced by an elected subcommittee consisting of three members. This committee will handle all matters concerning both the SABS and the IEC including appointment of suitable AMEU representatives to the various technical committees.

5. TENDER PREFERENCES

5.1 Provision is made in the four provinces' Local Government Ordinance, in respect of tender preferences in terms of local content. An additional preference is allowed in respect of goods bearing the SABS mark.

5.2 At the instigation of the Department of Commerce and Industry new tender preferences for local content will soon be prescribed. The amendment to tender preferences will be welcomed, particularly if the following aspects are taken into account.

5.3 *Tender preference for local manufacture*
It sometimes happens that an overseas producer will get rid of his old equipment in South Africa at a very low price, known as "dumping". Even the current tender preferences are not adequate enough to restain this practice.

In other cases it has been solemnly promised that the goods, on award of the tender, are to be manufactured locally, but once the order is placed local conditions have suddenly deteriorated to such an extent that local manufacture can no longer be carried out.

Cases are also known where the local supplier has obtained pirate parts from the countries behind the Iron Curtain which are cheaper than the parts offered by the overseas manufacturer, but which are of a very much inferior quality.

Notice should be taken that the Electrical Engineer is closest to the consumer in the supply hierarcy and can therefore evaluate the risks related to the quality of the goods. Items fitted to a large number of consumer installation must be guaranteed by an authority other than the supplier to conform to the specifications as far as both quality and after-sales services are concerned. It is insufficient to only mention this in tender documents. In this regard it would therefore be better for liaison to take place between City Electrical Engineers, City Councils, Provincial Councils and Government Departments. Reciprocal trust and liaison must be promoted and here I see a significant role for the AMEU.

5.4 *Preference to goods bearing the SABS mark*
Preference given to goods bearing the SABS mark is not adequate enough to eliminate the following malpractices:

5.4.1 Cases are known where a local authority has purchased material from overseas producers, because the locally made article bearing an SABS mark, was far more expensive. The truth of the matter was simply that the overseas product was of an extremely poor quality and not in any way comparable with the product bearing the SABS mark.

5.4.2 The SABS Board places a levy on all articles bearing the SABS mark.

Manufacturers of products which do not bear the SABS mark but which do comply with a standard specification, are, I feel, not being given sufficient incentive to obtain the SABS mark because, and it was said to me in so many words: the levy and the strong control which is instituted to ensure that the article conforms to the requirements, make that article more expensive. Has the time not come therefor that this levy be applied to all locally produced articles, whether the specific article satisfies the requirements of the mark or not, in fact this levy should also be applied to those specific articles which are imported.

This observation particularly concerns electrical goods sold by chain stores to the public.

ware wat by kettingwinkels aan die publiek verkoop word.

6. OORSESE STUDIES EN BESOEKE

6.1 Soos reeds vermeld stuur die V.M.E.O. jaarliks minstens een bestuurslid of president om as lid van die Suid-Afrikaanse Nasionale Komitee, wat deur die S.A.B.S. gelei word, aan die jaarkongres van die Internasionale Elektrotegniese Kommissie deel te neem.

6.2 Die V.M.E.O. het egter ook bestuurslede afgevaardig om in samewerking met die N.B.N.I., die Departement van Arbeid, ensovoorts sekere bedradingstelsels te ondersoek. Dié verslag sal ook tydens hierdie konvensie bespreek word. Wanneer die verslag bespreek word, sal u met my saamstem oor die belangrikheid om deel te hê aan sulke projekte wat uiters waardevol vir ons land is.

6.3 In die huidige tydvak word Suid-Afrika die voorreg ontneem om aan verskeie internasionale organisasies deel te hê. Om hierdie rede behoort die V.M.E.O. jaarliks minstens een persoon af te vaardig om die geledere van die Nasionale Komitee te versterk.

7. SAMEWERKING

7.1 Dit was vir my 'n voorreg om die loodsing van die lae energie-eksperimentele huisprojekte (LEEHP), aangebied deur die N.B.N.I., op 18 September 1978 te kon bywoon.

7.2 Tydens die opening het dr. T. L. Webb aan my die vraag gestel: "Hoe dra 'n mens dit oor aan die publiek?"

7.3 Hierdie projek gebruik sonenergie om 'n huis te verhit en om water vir waterverwarmingsdoeleindes te voorverhit. Daar word ook gebruik gemaak van hitte-uitruiling vir hergebruik gedurende die nag.

7.4 Die ontwikkeling van sonverhitte waterverwarmers en voorverhitters is stadig en heelwat van die aanbiedings op die mark is van twyfelagtige gehalte. Verdere navorsing is noodsaaklik.

7.5 In samewerking met hierdie ontwikkeling verkry die afskakeling van elektriese waterverwarmers, deur middel van 'n rippelrelê, veral met die verhoging in die EVKOM-tariewe, meer momentum.

7.6 Indien die voorafgaande stelsels sonder die nodige koördinasie toegepas word, kan heelwat probleme ontstaan. So bv. kan sonenergie vir waterverwarmingsdoeleindes aangewend word maar vir daardie 40 dae in die jaar wanneer daar nie sonenergie beskikbaar is nie mag van elektriese energie gebruik gemaak word. Dit plaas 'n groot las op die voorsiener aangesien hy genoegsame voorsiening moet maak vir hierdie tipe toevoer. Dit mag meebring dat 'n spesiale tarief gehef sal moet word vir dié doel, wat dan die hele konsep van gebruik van sonenergie vir waterverwarmingsdoeleindes sal benadeel.

7.7 Dit is dus noodsaaklik dat 'n dieptestudie deur al die betrokke instansies van die hele aangeleentheid van die doelmatige gebruik van son- en elektriese energie gedoen moet word en dat 'n gesamentlike gebruikskode en voorligtingstukke opgestel moet word. Na die daarstelling van 'n kode kan met behulp van die V.M.E.O., V.M.B., Stadsrade en betrokke departemente van stadsrade op 'n gekoördineerde wyse die doelmatige gebruik van son- en elektriese energie bevorder word.

8. DIE TOEKOMS

8.1 *Huidige tendens en toekomsblik*
As gevolg van die huidige insinkings in die ekonomie tesame met die probleme wat ondervind word om geld op die oorsese kapitaalmark te bekom, en die verhoging in die EVKOM-tariewe, word in sommige kringe gepraat van:

(a) elektriese projekte afstel want geld is nie beskikbaar nie;

(b) die publiek laat verstaan dat hulle nie bykomende elektrisiteit mag gebruik nie, want dit bring hoër uitgawes mee;

(c) die publiek laat verstaan dat die tyd nou aangebreek het dat hulle tevrede moet wees met 'n swakker diens, (soveel so dat hulle tot 12 uur of meer moet wag voordat die toevoer herstel sal word);

(d) selfs aandring dat 'n beperking geplaas behoort te word op die bou van kragstasies van 'n multi-miljoen rand en ander projekte van EVKOM.

As hierdie idees ontleed word, word onder andere gevind dat

6. OVERSEAS STUDIES AND VISITS

6.1 As has been said previously, the AMEU sends at least one committee member or the president, as a member of the South African National Committee, led by the SABS, to take part in the IEC annual congress.

6.2 The AMEU has also designated committee members to work in cooperation with the NBRI, the Department of Labour, etc. in investigating certain wiring systems. A report on this matter will be discussed during this convention. When the discussion of this report comes up I am sure you will agree with me regarding the importance of being a party to such projects which are of great value to our country.

6.3 The present situation precludes South Africa from taking part in various international organisations. For this reason the AMEU should delegate at least one person annually to strengthen the ranks of the National Committee.

7. CO-OPERATION

7.1 It was a privilege for me to be able to attend the launching of the NBRI's low energy experimental housing project (LEEHP) on the 18th September 1978.

7.2 During the opening Dr T. L. Webb put the following question to me: "How does one convey this to the public?"

7.3 This project makes use of solar energy to heat a house, and to pre-heat the hot water. A heat exchanger is also used to warm storage heaters for space heating.

7.4 The development of solar heated geysers and preheaters has been slow and many of the units available on the market are of doubtful quality. Further research is essential.

7.5 Together with this development the switching off of electrical geysers by means of a ripple-relay, particularly in the light of the increase in ESCOM tariffs, is gaining momentum.

7.6 If these systems are applied without the necessary co-ordination, problems can arise. For instance solar energy can be used for the heating of water, but for the 40 days per annum when there is no solar energy, electrical energy can be used. This places quite a load on the supplier as he has to make adequate provision for this. It may mean that a special tariff will have to be applied for this purpose which will then diminish the viability of the use of solar energy for the heating of water.

7.7 So an in-depth study will have to be undertaken of the effective use of solar and electrical energy by all bodies involved and a joint code of practice and information sheet compiled. Once a code has been drawn up with the assistance of the AMEU, UME and Town Councils as well as the departments concerned within the councils, the effective utilisation of solar and electrical energy can be promoted in a co-ordinated way.

8. THE FUTURE

8.1 *Current trends and future outlook*
As a result of the current economic recession and the problems encountered in obtaining overseas capital, as well as the increase in ESCOM tariffs, in some circles there is talk of:

(a) postponement of electrical projects because money is not available;

(b) making the public understand that they cannot use additional electricity as this brings about higher expenditure;

(c) making the public understand that the time has come for them to be satisfied with a weaker service (to the extent that they may have to wait up to 12 hours for the supply to be repaired);

(d) even to insist that a restriction should be placed on the erection of power stations costing millions of rands and other ESCOM projects.

hierdie projekte afgestel sal moet word omdat ander projekte andersins in die slag sal moet bly. Dit is dus nodig dat ons by hierdie konvensie vir 'n wyle stilstaan en 'n blik rig op wat die toekoms vir ons inhou asook die tempo van verandering, en dan daaruit sal besef watter geweldige taak daar vir ons almal voorlê. Aangeheg by hierdie verslag is sekere grafieke waarvolgens voorspellings gemaak word van wat ons in die toekoms kan verwag.

Die bevolking van die aarde sal teen die einde van hierdie eeu ongeveer 6 biljoen wees. (Grafiek 1).

Die vinnigste spoed waarteen 'n mens in die 19e eeu kon beweeg het, was ongeveer 25 myl per uur — te perd. Vandag is dit ver oor die 10 000 myl per uur. (FGrafiek 2.)

Net so het die plofkrag, met die ontwikkeling van die atoombomme, astronomies gestyg. (Grafiek 3.)

In die jaar 1455 het seker die belangrikste ontdekking in die kommunikasiewese plaasgevind, naamlik toe Gutenberg die drukpers ontwikkel het. (Grafiek 4.) Hierdie ontwikkeling, meer as enigiets anders, het bygedra tot die skielike toename in die tempo van verandering in feitlik alle aspekte van ons lewe. Deur die boeke te bestudeer kon die mens leer om voort te gaan vanwaar hulle voorgangers opgehou het, en dus nie nog 'n leeftyd verspil deur dinge te ontwikkel wat reeds al moontlik voorheen ontdek was, nie. Die gevolg was dus 'n uitbarsting van ontdekkings, uitvindings en teorieë.

As ons dan nou hierdie tempo waarmee verandering plaasgevind het op 'n grafiek teenoor tyd vaslê, vind ons dat dit na oneindigheid strewe. (Grafiek 5.)

Uit die voorafgaande feite blyk dit dus dat ontwikkeling nie skielik tot stilstand gebring kan word nie. Die verbruik van elektrisiteit sal voortgaan, daar sal afplatting wees tydens ekonomiese slapte of gedurende oorloë, maar dit sal weer daarna die gewone tempo handhaaf.

In hierdie verband is die groeikurwes van kWh.-verbruik in Suid-Afrika op grafiek 6 aangebring. Dieselfde tendens as op die ander grafieke kan waargeneem word.

Agbare Burgemeester, gaste, dames en here ons kan dus aflei van hierdie grafieke dat redelike akkurate statistieke verkry kan word voor die jaar 2000. Dit wil voorkom asof voorspellings of tendense moeilik bepaalbaar is na die jaar 2000.

8.2 *Kurwes van kW.h (energie)*
In grafiek 7 is die kW.h-verbruik van verskillende lande op 'n logaritmiese skaal weergegee.

Vanaf die kurwe van die kW.h-verbruik van 'n land kan die groeikurwe getrek word wat op die grafieke deur die stippellyne weergegee word. Hierdie kurwes kan nou gebruik word as 'n maatstaf waarteen die stand van ontwikkeling van 'n land gemeet kan word. Die kurwes toon duidelik 'n afplatting gedurende depressiejare en gedurende oorloë maar toon dat dit weer terugneig na die groeikurwe. Dit is moontlik dat die groeikurwe vir die R.S.A. heelwat sal verander wanneer die swart inwoners meer elektrisiteit gaan verbruik.

8.3 *Die behoud en beter benutting van elektrisiteit*
Uit hierdie statistieke is dit duidelik dat die toekoms 'n groot uitdaging bied aan alle sektore van ons samelewing.

Dames en here ek kan met eerlike oortuiging sê dat ons voorbereid is vir die uitdaging van die toekoms, want uit die aard van ons opgelegde taak moet ons gedurig vir die toekoms beplan. Tendense, ekonomies en andersins, word gedurig deur ons in aanmerking geneem om die toekomstige beplanning te doen en om betyds projekte in werking te stel. Die begrip is vir ons nie vreemd nie, maar daar bestaan by tye twyfel by my of diegene met wie ons in die munisipale hiërargie moet skakel, bewus is van die uitdaging van die toekoms.

Dit is 'n bekende feit, soos blyk uit die openingsrede van mnr. Hough, dat ons energiebronne nie vir ewig sal hou nie. Dit is dus een van ons opgelegde take vir die toekoms om elektrisiteit beter te benut en om die publiek en verbruikers op te lei om dit te doen. Dit is om hierdie rede dat die tema van hierdie konvensie gekies is, as: "Behoud en beter benutting van elektrisiteit". Ek vertrou dat die besprekings wat sal plaasvind en die referate wat gelewer sal word, vir ons almal van groot belang sal wees.

9. OPLEIDING

Die verslag van die komitee belas met Tegniese Opleiding sal aan u

If these ideas ara analysed then it is found, interalia that these projects must be postponed because otherwise other projects will suffer. So at this convention we need to pause a while and to cast our minds to the future and what it holds for us, and to consider the rate of change, and from that we will realise how great a task lies ahead of all of us. Attached you will find some graphs which give a forecast of what can be expected in the future.

By the end of this century the world's population will be in the region of 6 billion. (Graph 1.)

The fastest one could go in the 19th century was approximately 25 mph by horse. Today, it's well over 10 000 mph. (Graph 2.)

Explosive power, with the development of the atomic bomb, has also increased dramatically. (Graph 3.)

In 1455 surely the most important discovery in the way of communications took place, namely the development of the printing process by Gutenberg. (Graph 4.) This development more than anything else, contributed to the sudden increase in the rate of change in practically every aspect of our lives. By studying books one could learn how to progress from the point at which one's ancestors stopped, and thus not spend a lifetime developing ideas which had probably been discovered previously. The result was thus an overflow of discoveries, findings and theories.

If we draw a graph of the rate at which change took place as against time, we find it shoots up towards infinity. (Graph 5.)

From the abovementioned it is quite clear that development cannot suddenly be brought to a halt. The use of electricity will continue, there will be a levelling off in consumption during bad times economically or during war, but thereafter the tempo will be maintained.

In this connection the growth curve of kW.h-consumption in South Africa is indicated in Graph 6. Here again the same trend as seen in the previous graphs can be observed.

Your worship the Mayor, guests, ladies and gentlemen we can therefore assume from these curves that a reasonably accurate projection can be made for the period prior to the year 2000. It appears, however, as if the making of forecasts and the prediction of trends becomes difficult thereafter.

8.2 *kW.h (energy) curves*
The kW.h consumption of various countries is given on a logarithmic scale in Graph 7.

From the curves illustrating the kW.h consumption of a country, growth curves can be drawn, these being the dotted lines on the graph. These curves can then be used as a yardstick against which the stage of development of a country can be measured. The curves clearly show a levelling off during depression years and war years followed by a movement back towards the growth curves.

It is possible that the growth curves for the RSA will change quite considerably when the Blacks consume more electricity.

8.3 *Conservation and better utilization of electrical energy*
From these graphs it becomes evident that the future holds a great challenge for all sectors of our community.

Ladies and Gentlemen, after serious consideration I can say that we are prepared to face the challenge of the future — because, by the very nature of the task which we are charged with, we have continually to plan for the future. Trends, economic and otherwise, are constantly being taken into account in order to plan for the future and to have projects timeously completed.

The concept is not strange to us, but sometimes I do have some doubt as to whether those persons with whom we have to deal in the municipal hierarchy are aware of the challenge of the future.

It is generally accepted, and Mr Hough confirmed this in his opening address, that our energy resources are limited. We are therefore obliged to use electricity more efficiently in the future and to educate the public and consumers to do the same. This is the reason why the theme of this convention has been selected as: "Conservation and better utilization of electrical energy". I trust that the papers to be presented and the discussions that follow will be of interest to us all.

9. TRAINING

The report of the committee charged with Technical Training

voorgelê word, waaruit u kan kennis neem van die bemoeienis van die V.M.E.O. met die opleiding van personeel en in die besonder die praktiese opleiding van vakleerlinge.

9.1 *Praktiese opleiding van geskoolde en halfgeskoolde personeel*
Met die versorging van oliegevulde kabels, die afmaak van gespesialiseerde soort kabellasse en die opleiding van personeel aan standaardpraktykgebruike, is daar 'n behoefte om geskoolde en halfgeskoolde personeel intensief vir hierdie take vir 'n week of twee op te lei, onmiddellik na hulle aanstelling, voordat hulle effektief gebruik kan word.

Ek beoog om so 'n intensiewe praktiese opleiding met behulp van die Vakleerlingskool in Roodepoort in werking te stel. Dit is dus wenslik dat die Komitee wat belas is met Tegniese Opleiding ook mettertyd aandag aan hierdie aspek sal skenk. Ek verneem dat EVKOM baie sukses behaal het met 'n soortgelyke praktiese intensiewe opleidingsentrum.

9.2 *Bestuursopleiding*
Lede van hierdie vereniging is besonder gelukkig dat die opleiding van ingenieurs en tegnici aan universiteite en kolleges geskied. Daar bestaan egter 'n leemte vir opleiding van lede van die vereniging in bestuurskennis, of beter omskryf as kennis van administrasie. Hoofamptenare word soms goed opgelei in verskeie bestuurstegnieke veral in stede wat naby die hoofsentra geleë is.

Om ekonomiese en ander redes is dit vir ander stadsrade weer nie moontlik om personeel in hierdie belangrike terrein op te lei nie. Ook sal gevind word dat ingenieurs nie so maklik afgevaardig word om bestuursopleiding te ondergaan nie.

Met die geweldige tempo van verandering, soos beskryf, en die uitdaging wat daar in die toekoms vir die ingenieur as 'n bestuurder voorlê, moet hy homself kan toerus met 'n doelgerigte kennis van bestuurstegnieke. Hierdie tegnieke is nie staties nie en moet gedurig bygewerk word.

Die V.M.E.O. behoort dus 'n indringende ondersoek te onderneem om te bepaal of daar 'n behoefte bestaan om bestuursopleiding te verskaf of te laat verskaf, of te reël vir bestuursopleidingsessies in verskillende sentra. Hierdie ondersoek behoort te bepaal watter besondere fasette van bestuursopleiding verskaf behoort te word, en of opleidingskursusse in organisering en mensekennis opgevolg behoort te word met spesiale gevorderde bestuursopleidingskursusse.

Bestuursopleiding aan universiteite is moeilik beskikbaar vir die stadselektrotegniese ingenieur en ander vorms en kanale van opleiding moet oorweeg word.

10. SLOT

As gevolg van die inkorting van die tydsduur van hierdie konvensie sal daar nie veel besprekingstyd beskikbaar wees vir die verslae nie. Hierdie verslae is uiters belangrik aangesien dit u in staat stel om deel te neem en rigting te gee aan toekomstige beleidsrigtings. Die lys van verslae sal in die toekoms eerder vermeerder as verminder, wat dus nog groter eise aan lede van die Uitvoerende Bestuur, ander betrokke lede en die Sekretaris sal meebring.

Ek glo dus dat die besprekings wat ons hier gaan hê sal dien om ons vertroue te verhef in die toekoms van ons land Suid-Afrika en die toekoms van die V.M.E.O. met besondere verwysing na sy toekomstige positiewe bydrae tot standaardisasie; tot samewerking in projekte van nasionale belang en tot ontwikkeling van sy skakeling met owerheidsweë.

Ek dank u.

will be presented and from the report you will note the trouble the AMEU has with the training of personnel and in particular, the practical training of apprentices.

9.1 *Practical training of skilled and semi-skilled personnel*
With the care of oil filled cables, the completion of specialised types of cable joints and the training of personnel in standard practices, a need exists for intensive training of skilled and semi-skilled personnel for these tasks — training over a week or two week period immediately after their appointment, before they can carry out their tasks effectively.

I envisage setting up such an intensive practical training course with the help of the School for Apprentices in Roodepoort. It is therefore desirable that the committee charged with Technical Training give attention meanwhile to this matter. I understand that ESCOM has had some considerable success with a similar intensive practical training centre.

9.2 *Management training*
Members of this association are particularly fortunate that the training of engineers and technical people takes place at universities and colleges. However, there is a gap in the training of members of the association in management science, or rather, the knowledge of administration. Top officials are sometimes well trained in various managerial techniques, particularly in towns situated near main centres.

For economic and other reasons it is not always possible to train personnel in this important aspect. It will also be found that engineers are not easily delegated to undergo managerial training.

With the incredible rate of change, as described earlier, and the challenge which the future holds for the engineer as a manager, he must be in a position where he can keep up and must therefore have a thorough knowledge of managerial techniques. These are not static techniques and must continually be revised.

The AMEU will therefore have to undertake an in-depth study in order to determine whether the need exists for supplying managerial training or to have such training supplied, or to arrange for managerial training sessions to be organised in the various centres. This study should determine what specific facets of managerial training should be supplied and whether training courses in organisation and human relations should be followed up with special advanced management training courses.

Management training at universities is hard to come by for the city electrical engineer and other types and channels of education will have to be considered.

10. CONCLUSION

Due to curtailment of the duration of this convention time for discussion of the reports will be limited. These reports are extremely important as they enable you to participate in and direct future policy trends. The number of reports will in future rather increase than decrease, which will place higher demands on members of the Executive Council, other members concerned and the Secretary.

I therefore believe that the discussions which we will have here will serve to enhance our faith in the future of our country South Africa and in the future of the AMEU with special reference to its future positive contribution to standardisation, to the co-operation in projects of national importance and to the development of its relations with state authorities.

I thank you.

BRONNELYSTE/REFERENCES

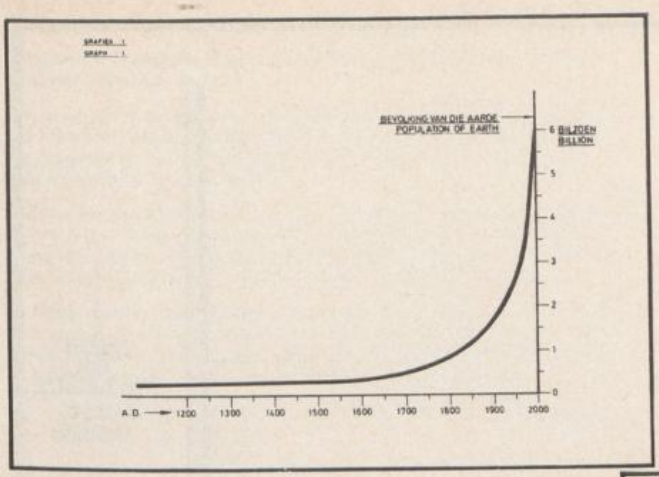
"The Analysis of kW.h Consumption Curves"
A. A. Middlecote — AMEU Convention, Umtali
VMEO Konvensie,

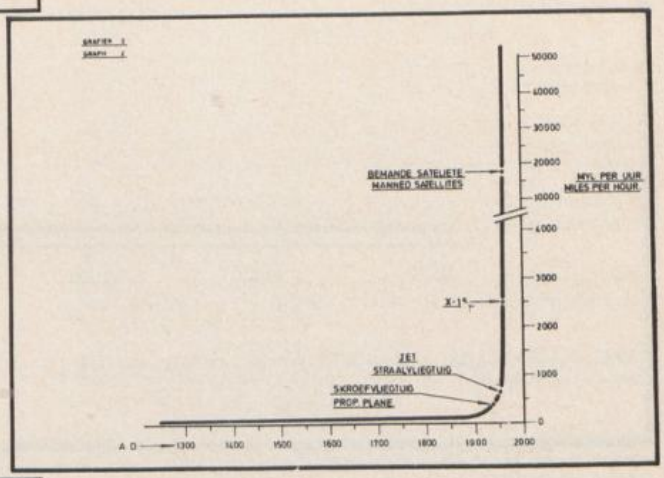
"Specifications, Standard and Standardization"
A. A. Middlecote — Pr. Eng., B.Sc. (Elect.)
Pr. Ing., B.Sc. (Elect.)

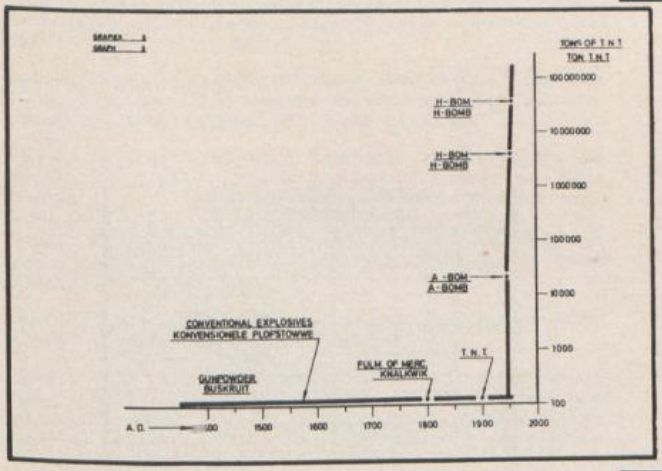
"A History of International Electrical Engineer Organizations"
A. A. Middlecote — Pr. Eng., B.Sc. (Elect.)
Pr. Ing., B.Sc. (Elekt.)

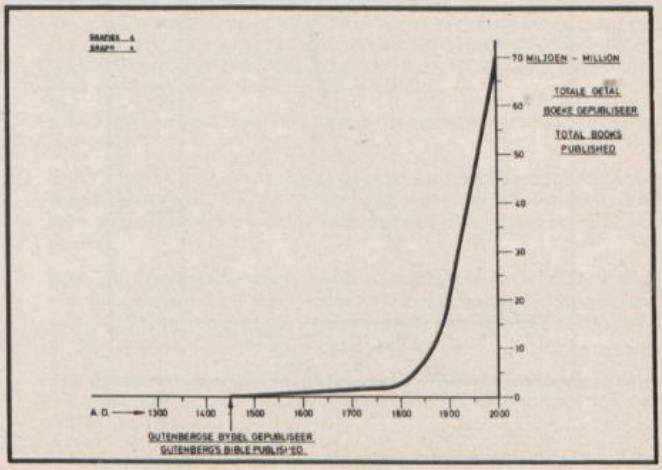
"The New Rural Society"
Dr Peter C. Goldmark (delivered at a Symposium in 1973, organised by the Engineer's Association of S.A. and UNISA)

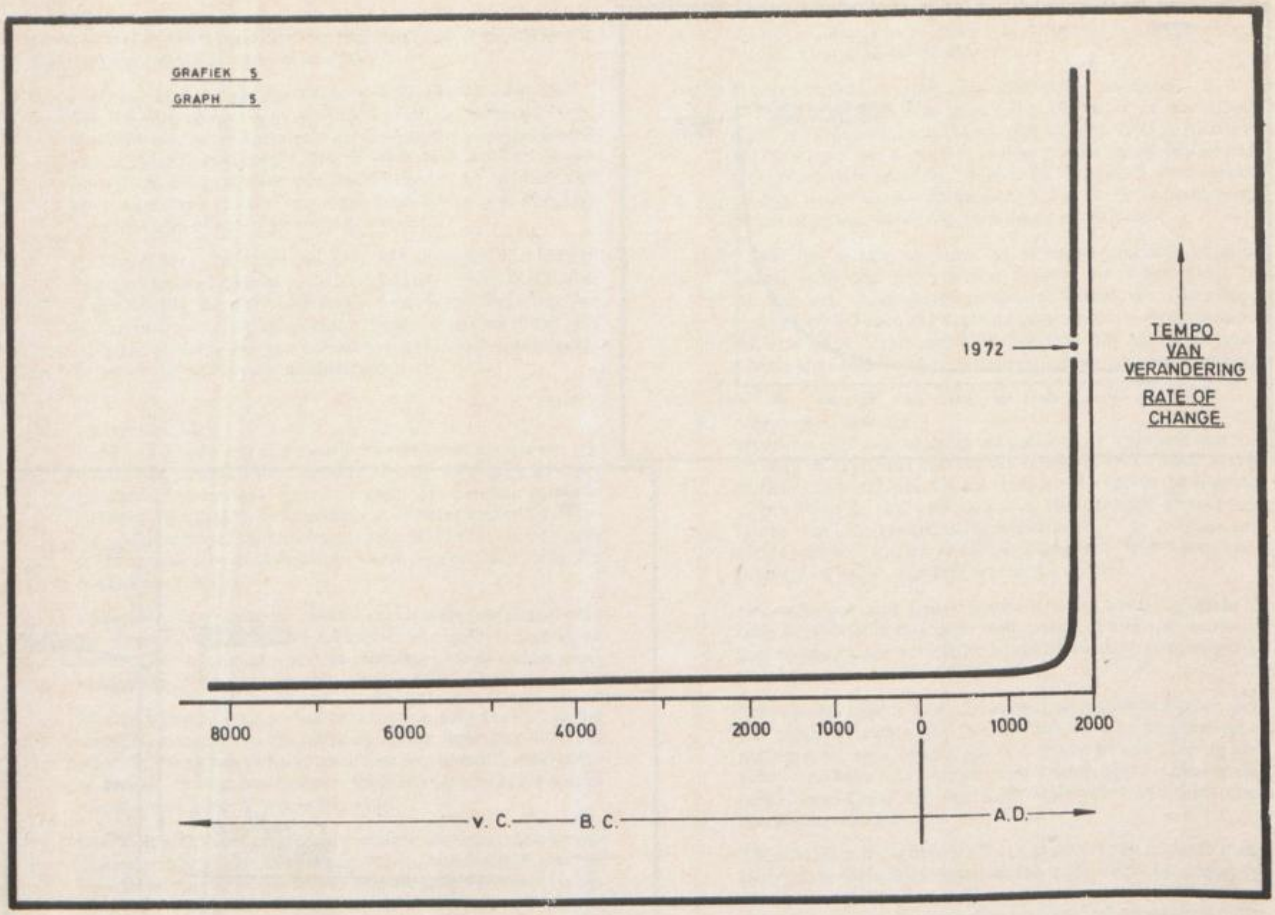
(gelewer tydens 'n Simposium in 1973, gereël deur die Ingenieursgenootskap van S.A. en UNISA).

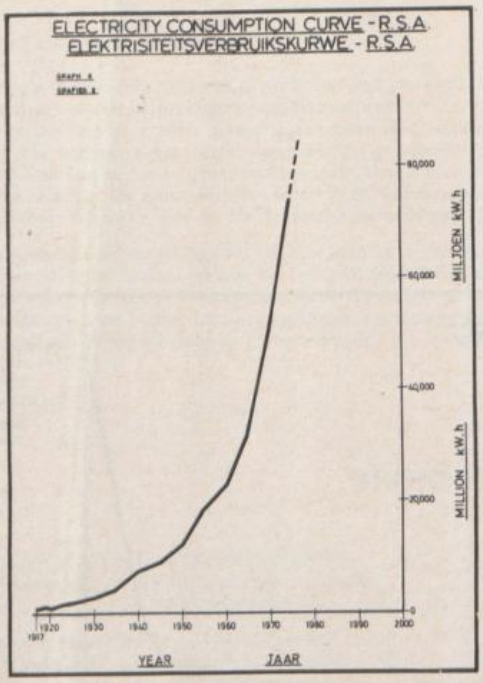

BEVOLKING VAN DIE AARDE
POPULATION OF EARTH
6 BILJOEN
BILLION
A.D.
1200
1300
1400
1500
1600
1700
1800
1900
2000

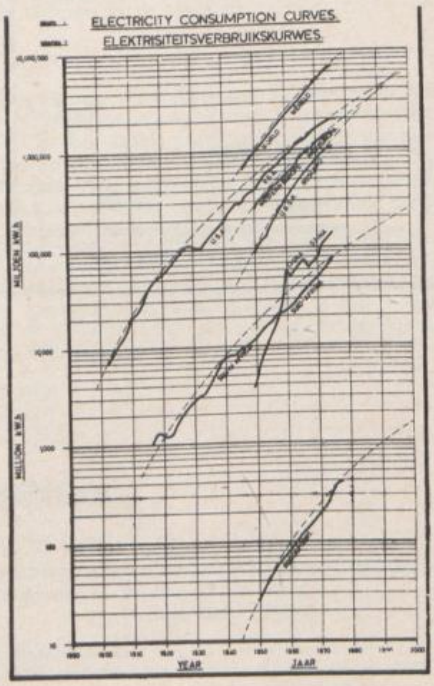

BEMANDE SATELIETE
MANNED SATELLITES
MYL PER UUR
MILES PER HOUR
X-15
JET
STRAALVLIEGTUIG
SKROEFVLIEGTUIG
PROP. PLANE
A.D.
1300
1400
1500
1600
1700
1800
1900
2000


TONS OF T.N.T
TON T.N.T
H-BOM
H-BOMB
A-BOM
A-BOMB
CONVENTIONAL EXPLOSIVES
KONVENSIONELE PLOFSTOWWE
GUNPOWDER
BUSKRUIT
FULM. OF MERC.
KNALKWIK
T.N.T.
A.D.
1500
1600
1700
1800
1900
2000


70 MILJOEN - MILLION
TOTALE GETAL
BOEKE GEPUBLISEER
TOTAL BOOKS
PUBLISHED
A.D.
1300
1400
1500
1600
1700
1800
1900
2000
GUTENBERGSE BYBEL GEPUBLISEER
GUTENBERG'S BIBLE PUBLISHED


GRAFIEK 5
GRAPH 5
1972
TEMPO VAN VERANDERING
RATE OF CHANGE
8000
6000
4000
2000
1000
0
1000
2000
V. C.
B. C.
A.D.


ELECTRICITY CONSUMPTION CURVE - R.S.A.
ELEKTRISITEITSVERBRUIKSKURWE - R.S.A.
80,000
60,000
40,000
20,000
0
MILJOEN kW.h
MILLION kW.h
1920
1930
1940
1950
1960
1970
1980
1990
2000
YEAR
JAAR


ELECTRICITY CONSUMPTION CURVES.
ELEKTRISITEITSVERBRUIKSKURWES.
MILLION kW.h
YEAR
JAAR

MNR. A. J. v.d. BERG, KRUGERSDORP

Meneer die President, Agbare Burgemeester en mevrou van der Walt, Eregaste, dames en here —

Dit is vir my 'n aangename voorreg en 'n besondere groot eer, meneer die President, om as u kollega hier op die Wesrand deel te mag hê aan die bespreking van u Presidentsrede wat ongetwyfeld heelwat navorsing en kosbare tyd geverg het.

Meneer die President — u keuse van 'n onderwerp vir u presidentsrede is van groot belang vir al ons kongresgangers omdat u ons nader gebring het aan die werksaamhede van die VMEO, en ek dink dat ons nou baie beter weet hoe die V.MEO by ander instansies inskakel.

U maak melding van die SABS verteenwoordiger, soos u dit vandag ken, en gee vir ons u mening oor hoe daar moontlik anders na die saak gekyk moet word. Persoonlike ervaring in hierdie verband noop my om te sê dat u voorstel vir my baie aanvaarbaar is, en dat dit die weg sal baan tot 'n beter benutting van breinkrag, wat ook tot gevolg sal hê dat die SABS personeel se taak vergemaklik sal word met die opstel van spesifikasies en gebruikskodes.

Die Uitvoerende Raad van die VMEO sal ongetwyfeld hierdie aangeleentheid deeglik moet navors en ons sien uit na die finale beslag in hierdie verband.

U verwysing na die bedradingskode — Meneer die President — en u gelukwensing aan die verskillende instansies word heelhartig onderstreep. Die finale ingebruikneming van die bedradingskode in die praktyk asook 'n keerdatum moet nog bepaal word. Voorts sien ons uit na die oordrag en werksaamhede van die aanbevelingskomitee aangaande nuwe elektriese toebehore en installasiepraktyke van die VMEO na die SABS. Ek is van mening dat die nuwe bedeling goed behoort te fungeer mits daar met die samestelling van die SABS aanbevelingskomitee dorgvuldige oorweging geskenk word, sodat voorsieners hulle regmatige aandeel behou in die besluitnemingsproses.

Wat u — Meneer die President — onder item 5.3 aangeroer het ten opsigte van tendervoorkeure aan plaaslike vervaardiging, moet ek u gelukwens dat u hierdie belangrike aangeleentheid in 'n neutedop opsom. Daar is gevalle bekend waar 33 kV oliestroombrekers na 'n dienstydperk van slegs tien jaar vervang moes word omdat onderdele nie beskikbaar was nie. Voorts is daar geen naverkoopdiens beskikbaar nie. Oorname van firmas en uitskakeling van sekere ontwerpe vererger die toestand nog meer. Dit is jammer dat 'n jong ontwikkelende land soos die Republiek van Suid-Afrika te doen kry met hierdie probleem wat niks anders as growwe uitbuitery is nie.

Dit is ongelukkig so dat aankope van baie artikels wat die SABS merk dra duurder is hoewel daar soms aan ons uitgewys word dat nié-merkdraende artikels wel voldoen aan 'n SABS spesifikasie.

Plaaslike owerhede, Provinsiale- en Regeringsinstansies word egter verplig om in sekere gevalle net SABS goedgekeurde items te koop. Dit is in belang van die verbruiker omdat daar geen waarborg is dat die nodige kontrole en inspeksie op nie-merkdraende items uitgevoer is nie. Trouens, daar was onlangs 'n geval waar verspreidingstransformators teen 'n aansienlike besparing aangekoop kon word indien die SABS goedkeuring nie 'n vereiste was nie.

Ek vertrou dat ons President, in sy ampstermyn, die saak wat hy aangeroer het verder sal kan opvolg.

Soos u tereg opmerk is die ontwikkeling van sonverhitte waterverwarmers en voorverhitters stadig en die gehalte laat veel te wense oor. Ek is bewus van 'n geval in Windhoek waar 'n installasie minder as een jaar diensbaar was en toe geheel en al geskraap moes word. Die installasiekoste het R400 000 oorskry.

Probleme met verwering en verskaling is nog nie uitgeskakel nie en navorsing word nog gedoen oor doelmatige hitte-uitruilers en geslotebaan vloeistofstelsels.

U voorstel — Meneer die President — dat 'n gebruikskode en voorligtingstukke opgestel moet word, behoort **dringende** aandag te geniet.

Mr. President it is indeed pleasing to note that, in your address under the topic "The Future", your graphs indicate that the future holds a great challenge for all sections of our community. Compared with growth rates a few years ago, the average growth rate of most municipalities is very low at present. If one considers the capital expenditure incurred to uprate systems to cope with demands which, in certain cases, have a direct bearing on electricity tariff structures, one can only hope that a reasonable growth rate will persist.

Many smaller municipalities are changing over to computerised accounting systems and approximately 60 percent of the cost involved for the appointment and training of qualified data processing, personnel, renting costs, etc. is being passed to trading departments. These extra costs together with Escom tariff increases, the difficulty in obtaining sufficient trained personnel to run the electricity department and lower grants, are factors the electrical engineer is faced with more forcefully than in the past. To my mind, careful planning is necessary to ensure a moderate spending rate in the future.

Meneer die President, laaste maar nie die minste nie wil ek graag melding maak van u aandeel en die sukses wat u steeds behaal as skakel tussen die VMEO en die SABS, reeds sedert 1971, sover dit die VMEO verteenwoordiging op tegniese komitees betref. U ywerige en onbaatsugtige diens het ander ingenieurslede aangespoor om ook hulle plek vol te staan.

Dit is dan nou vir my aangenaam, Meneer die President, om u hartlik geluk te wens met 'n baie interessante en insiggewende Presidentsrede, en ek stel nou formeel voor dat dit met dank in die verrigtinge van die VMEO opgeneem en bewaar word.

Baie dankie.

MR. A. H. L. FORTMANN, BOKSBURG

Mr. President, your Worship the Mayor, Councillor and Mrs. van der Walt, ladies and gentlemen —

Mr. President, I am deeply honoured that I have been given the privilege of seconding the adoption of your address.

I have known our newly elected President for many years and prior to my move to Boksburg, spent a number of years in his Department.

It is evident that your address necessitated a great deal of research and I am sure I speak on behalf of all members present, when I say that your address was very interesting and is a valuable document for posterity.

It is with a measure of trepidation and disappointment that I read of the decision by the United Municipal Executive to limit the duration of our Convention to three days.

Presumably the main reasons for this action are, firstly, because other institutes or bodies hold three-day conferences, and secondly, because of the depressed economy.

I venture to say that the nature of business conducted by the AMEU, warrants four-day conferences and I hope the UME will review its decision when the economy has improved.

Without in the least trying to be presumptuous, I can state that the members of the AMEU are men of some standing, holding senior and responsible positions in the public sector of our country, and conventions and meetings of this nature, where exchange of views and debates on important technical and other matters take place, are vitally important and benefit not only the members concerned, but more important, the local authorities they are representing and serving. I trust the UME will view this in the same light.

The progress the South African Bureau of Standards has made and the good relationship between the SABS and the AMEU is indeed heartening.

It is interesting to note the apparent change of heart by the AMEU at the 1947 Convention following the 1945 Convention where deep concern was voiced with the proposed Standards Act. It obviously did not take the AMEU long to realise their folly and recognise that "here was a good thing".

Meneer die President, die belangrikheid van standaard spesifikasies vir masjinerie, materiaal, ens., kan nie sterk genoeg beklemtoon word nie. Nie net standaard spesifikasies wat die SABS betref nie, maar ook dié van die IEK met 'n verbintenis deur die SABS, is net so belangrik.

Met standaard spesifikasies wat wêreldwyd gebruik word, kan 'n land op internasionale vlak handel dryf, wat natuurlik ook vir Suid-Afrika van groot waarde is en sal wees. Suid-Afrika se voorspoed sal seker op die lang duur meer op handel met vervaardigde goedere berus as dié op die uitvoer van rou materiaal. Daar kan maar net na lande soos Duitsland en Japan gekyk word om dit te besef.

Die VMEO kan dus trots wees daarop om aan vele tegniese komitees te behoort.

Die VMEO se verteenwoordiging op sommige SABS-komitees vir huishoudelike toebehore is 'n eervolle daad, wat bydra om die verbruiker teen die vervaardiging van moontlik minderwaardige toebehore te beskerm.

Mnr. die President, u verwys na die belangrikheid van VMEO-deelname aan internasionale organisasies soos byvoorbeeld, die jaarkongres van die IEK by wyse van lidmaatskap van die Suid-Afrikaanse Nasionale Komitee wat deur die SABS gelei word.

Hierdie sienswyse moet sterk ondersteun word. Daar bestaan geen twyfel dat kontak op die vlak, soos u dit sien, net tot voordeel van die VMEO kan strek.

Wat opleiding betref, mnr. die President, stem ek met u saam.

Die praktiese opleiding van vakleerlinge is iets wat die laaste tyd goeie aandag geniet en ons hoop dat ons die vrugte daarvan sal pluk.

Daarenteen is daar veel wat gedoen behoort te word met die opleiding van hoofamptenare, in besonder wat bestuurstegnieke betref.

Ons hoop dat u hierdie aangeleentheid by die VMEO se Uitvoerende Bestuur verder aandag kan gee.

'n Saak wat wel kommer wek, is die uitermatige tekort aan elektrotegniese ingenieurs. 'n Onlangse opname by die Hoëveldtak van die VMEO het getoon dat die vakante poste vir ingenieurs, met Johannesburg ingesluit, letterlik dosyne beloop. Iets is hier nie pluis nie, meneer die President. Òf die werksaamhede van Plaaslike Besture is van so 'n aard dat dit baie onaanloklik is, hier ontstaan dan die vraag, waarom? Òf die salarisse wat betaal word, sowel as die byvoordele, is so swak dat dit geen aanloklikheid vir ingenieurs inhou nie.

Ek hoop van harte dat die owerhede hierdie aangeleentheid in die besonder onder die vergrootglas sal plaas.

Ladies and Gentlemen, I am sure you will agree that our President presented us with a most interesting address and I would like to take this opportunity, Mr. President, of thanking you for, and congratulating you on your address, and wishing you well in your term of office.

Mr. President, it now gives me great pleasure to second the adoption, proposed by Mr. van den Berg, of your Presidential Address.

MR. D. H. FRASER, President-Elect.

Now, Ladies and Gentlemen, in handing control of the meeting back to the President, I would like to extend to him my personal congratulations on his address which I found very interesting, thank you.

GRONDWETWYSIGINGS VOORGESTEL DEUR DIE UITVOERENDE RAAD

WOORDOMSKRYWINGS: **A1**

Klousule 1.5:

Skrap die woorde:

"en 'n Blanke is".

Klousule 1.6:

Skrap die woorde:

"met inbegrip van die Gebied van Suidwes-Afrika".

INDELING VAN LEDE: **A2**

Klousule 6.1:

Skrap die woorde:

"wat Blankes is en".

STEMMING DEUR LEDE: **A3**

Klousule 11.1:

Wysig die klousule om te lees:

"Elke lidonderneming is by die konvensie of tegniese vergadering geregtig op twee stemgeregtigde verteenwoordigers wat vir dié doel deur die lidonderneming benoem moet word. Een sodanige verteenwoordiger moet die raadsverteenwoordiger en die ander een 'n ingenieurlid, 'n assosiaatlid of geassosieerde wees. Indien slegs die persoon in algehele bevel van 'n lidonderneming en wat nie 'n ingenieur- of assosiaatlid is nie 'n lidonderneming verteenwoordig, het hy ook stemreg".

SAMESTELLING VAN UITVOERENDE RAAD: **A4**

Klousule 14.1:

Wysig die klousule deur die invoeging tussen sub-klousules 14.1.4 en 14.1.5 van die volgende sub-klousules:

"14.1.4 bis: die uittredende President, so lank hy 'n ingenieurlid is".

"14.1.4 ter: die raadsverteenwoordiger van die onderneming wat deur die uittredende President verteenwoordig word".

CONSTITUTION AMENDMENTS PROPOSED BY THE EXECUTIVE COUNCIL

DEFINITIONS:

Clause 1.5:

Delete the words:

"and who is White".

Clause 1.6:

Delete the words:

"and includes the Territory of South West Africa".

CLASSIFICATION OF MEMBERS:

Clause 6.1:

Delete the words:

"who are White and".

VOTING BY MEMBERS:

Clause 11.1:

Amend this clause to read:

"At any convention or technical meeting each member undertaking shall be entitled to two representatives with voting rights, who shall be appointed by the member undertaking for this purpose. One such representative shall be the council representative, and the other an engineer member, and associate member or an associate. Should only the person in overall charge of a member undertaking, and who is not an engineer or associate member, be present, he shall also be entitled to vote".

COMPOSITION OF EXECUTIVE COUNCIL:

Clause 14.1:

Amend this clause by the insertion, between sub-clauses 14.1.4 and 14.1.5 the following sub-clauses:

"14.1.4 bis: the immediate Past President as long as he is an engineer member".

"14.1.4 ter: the council representative of the undertaking represented by the immediate Past President".

GRONDWETWYSIGINGS VOORGESTEL DEUR DIE GOEIE HOOP-TAK IN TERME VAN KLOUSULE 25.2

INDELING VAN LEDE:

Klousule 6.2.2:

Wysig die benaming:

"Ingenieurslede" na "Lede".

Klousule 6.2.3:

Skrap die benaming:

"Geassosieerdes".

KWALIFIKASIES VAN LEDE:

Klousule 7.2.2:

Wysig die klousule om te lees:

" 'n Lid is die persoon in algehele bevel van 'n lidonderneming".

Klousule 7.2.3:

Die klousule word geskrap.

Klousule 7.2.4:

Wysig die klousule om te lees:

"7.2.3 Assosiaatlid:
Een of meer assistente in die permanente diens van 'n lidonderneming kan as assosiaatlede toegelaat word".

Klousule 7.2.5:

Wysig die klousule om te lees:

"7.2.4 Voormalige Lid:
'n Lid of 'n assosiaatlid wat ophou om 'n betrekking te beklee wat hom ingevolge sub-klousules 7.2.2 of 7.2.3 vir lidmaatskap laat kwalifiseer, dan deur die Uitvoerende Raad as voormalige lid toegelaat word".

ALGEMEEN

Dat die benaming "ingenieurslid" verander word na "lid" waar dit ook al in die Grondwet mag voorkom en dat die klousules en sub-klousules hernommer word waar van toepassing.

CONSTITUTION AMENDMENTS PROPOSED BY THE GOOD HOPE BRANCH IN TERMS OF CLAUSE 25.2

B1 CLASSIFICATION OF MEMBERS:

Clause 6.2.2:

Amend the designation:

"Engineer Members" to "Members".

Clause 6.2.3:

Delete the designation:

"Associates".

B2 QUALIFICATIONS OF MEMBERS:

Clause 7.2.2:

Amend this clause to read:

"A Member is the person in overall charge of a member undertaking;;.

Clause 7.2.3:

This clause is deleted.

Clause 7.2.4:

Amend this Clause to read:

"7.2.3 Associate Member:
One or more assistants in the permanent service of a member undertaking can be admitted as associated members".

Clause 7.2.5:

Amend this clause to read:

"7.2.4 Past Member:
A member or an associate member who ceases to hold a position which makes him eligible for membership in terms of sub-clause 7.2.2 and 7.2.3 may by admitted by the Executive Council as a Past Member".

GENERAL

That the designation "Engineer member" be changed to "member" wherever it appears in the Constitution and that the clauses and sub-clauses be re-numbered where applicable.

Mr. W. Barnard addressing the Convention.

MR. P. J. BOTES, President

Ladies and Gentlemen — we now proceed to the next item on the Agenda which is the adoption of amendments to the constitution:

Quite a number of alterations to the Constitution have been proposed, but we can take a short route in considering certain principles and, if adopted, the amendments as proposed will become mainly a matter for editing. We will, therefore, deal with the principles involved rather than discussing each clause. The first principle to be considered is contained under items A.1 and A.2.

These two amendments are self explanatory, and would like to put it to the vote if there are no further amendments; any further amendments? Can we take it that you are in agreement? It looks as if everybody is in agreement. Thank you.

The next amendment is an addition to Clause 11.1, and the addition reads as follows:

> "Should only the person in overall charge of a member undertaking, and who is not an engineer or associate member, be present, he shall also be entitled to vote."

Since there are no objections, this amendment can be adopted. Thank you.

Die wysigings onder item A.4 is ook self verduidelikend, en dit maak voorsiening dat die Uittredende President asook sy Raadsverteenwoordiger van die Uitvoerende Raad bly vir een termyn.

Here, again, there are no objections, so the amendment is adopted. Thank you.

The next amendments under items B.1 and B.2 to the Constitution were submitted by the Cape of Good Hope Branch.

Mr. Louw of Paarl will elaborate on this.

MNR. H. A. L. LOUW, PAARL

Meneer die President — Ek is baie lank al 'n lid van die VMEO maar nog maar 'n nuweling by Konvensies. Ek wil daarom eers, om onsekerhede uit die weg te ruim, myself bekend stel as 'n ingenieurslid van die VMEO, gegradueerd en 'n geregistreerde professionele ingenieur.

Ek gaan praat oor die voorgestelde wysigings aan die grondwet soos deur die Goeie Hoop-Tak voorgestel, in sover as wat dit gaan om lidmaatskapindeling.

Lidmaatskap word kortliks tans as volg ingedeel — Erelede, Ingenieurslede, Geassosieerdes, Assosiaatlede, Voormalige lede. Ons betoog gaan om die ingenieurslede, geassosieerdes en assosiaatlede.

Die Grondwet gee tans die volgende definisies aan:

1. 'n Ingenieurslid is die ingenieur in algehele bevel van 'n lid onderneming, welke ingenieur die ondervinding en kwalifikasies besit wat vir die Uitvoerende Raad aanvaarbaar is.

3. Geassosieerdes: Een of meer assistent ingenieurs in die permanente diens van 'n lid onderneming wat die kwalifikasies en ondervinding besit wat vir Uitvoerende Raad aanvaarbaar is.

3. 'n Assosiaatlid is 'n Persoon wat in bevel van 'n lid onderneming is en wat nie oor die ondervinding en kwalifikasies beskik wat vir die Uitvoerende Raad aanvaarbaar is vir ingenieurlidmaatskap nie.

Toe verskyn bulletin 134 in Mei 1978. Daarvolgens het die Uitvoerende Raad besluit:

> Eerstens, dat 'n Ingenieurslid 'n B.Sc Ing. plus 3 jaar toepaslike ondervinding of 'n geregistreerde Professionele Ingenieur moet wees.
>
> Tweedens, dat Persone wat, alhoewel in bevel van 'n lid onderneming, maar net die Staatsertifikaat van Bevoegdheid of Nasionale Hoër Sertifikaat, of Nasionale Hoër Diploma of Nasionale Tegniese Diploma het plus 3 jaar toepaslike ondervinding, so 'n persoon sal 'n assosiaatlid wees.
>
> Derdens, dat 'n Assosiaat moet in diens wees van 'n lid onderneming as Adjunk of Assistent met enige van die voorgenoemde kwalifikasies plus 3 jaar toepaslike ondervinding.

Nou moet ek u sê, Meneer die President, dat of hierdie bepaling van bulletin 134 nou intussen teruggetrek is of nie; die lede van die Goeie HoopTak hewig ontsteld was met die bepalinge.

U sien, Meneer die President, in Wes-Kaap is daar bitter min groter ondernemings terwyl in Transvaal byvoorbeeld daar meestal groter ondernemings is. Die onmiddellike effek van bulletin 134 was dat die oorgrote meerderheid van die Goeie Hoop-Tak lede onmiddellik gedegradeer was van ingenieurslede tot assosiaatlede. Ek kan my voorstel dat in ander gebiede dieselfde in meer of mindere mate geskied het. Ons weet dit was voorlopig nie op die bestaande indeling van toepassing nie, maar nogtans.

Meneer die President, ek as 'n professionele ingenieur wil net hierdie vraag aan ander van my geleerde kollegas in hierdie Konvensie vra: Sal u bereid wees om op die kleiner plekke, sê maar, Piketberg of Barrydale, die ingenieur in bevel te wees teen 'n bes moontlik baie laer salaris en moontlik ook laer status, sonder genoegsame ondersteunende personeel? Ek glo u sal deur die bank sê "nee dankie, hou dit maar". Nou wat staan die kleiner onderneming te doen? Hy moet noodwendig 'n laer gekwalifiseerde persoon aanstel, maar onthou, hierdie persoon het dieselfde probleme, moet dieselfde wette administreer en het presies dieselfde verantwoordelikheid onder die Fabriekswet.

Die bepaling soos in bulletin 134 genoem ontneem ook die voorreg van baie lede, hoe bekwaam hul ook al mag wees, om ooit die President van die VMEO te word, of om selfs lid van die Uitvoerende Raad te word. Ek verwys u in hierdie verband na Klousules 13 en 14 van die konstitusie.

Mr. President, one of the principal objects of our Association is, and I quote clause 4.2 of the constitution, "To bring together municipal councillors, electrical engineers and all persons interested in the advancement of undertakings, and to promote wider contact and the exchange of views."

The Good Hope Branch unanimously instructed me to put to this Convention the proposed amendments to the Constitution as contained under B1 and B2 of this Agenda and which in effect mean the following:

1. That the distinction between "engineer member" and "associate member" be abolished and only one designation and that is "member".

2. A "member" is then simply defined as: A "member" shall be the person in overall charge of a member undertaking.

3. The classification associate will fall away and persons formerly called associates will now be classed as associate members and defined as follows:

   One or more assistants in the permanent service of a member undertaking and who may be admitted as associate members —

4. To fall in line with this, the definition of a "past Member" is also slightly changed.

The motivation of the Good Hope Branch for these proposed changes is as follows:

(a) The Association of Municipal Electricity Undertakings is in the first instance an association of **electricity undertakings;** since October 1971 **all** undertakings qualify for membership. Prior to that date membership of an undertaking depended upon the qualifications of the person in charge of the undertaking. As all member undertakings have two votes it is pointless to distinguish among the membership of natural persons with the same voting rights.

(b) The Good Hope Branch feels that the AMEU is not a professional body and membership thereof should not be determined by professional qualifications.

(c) Councils are in the first instance responsible for the appointment of the persons to take charge of their undertakings and may well ask why, if the undertaking qualifies for full membership, their employee is discriminated against on the basis of experience or qualifications. It is for a Council to decide whether the person it wishes to employ is sufficiently experienced and qualified for the position and not the AMEU.

Meneer die President, tydens die teepouse het ons Tak verneem dat die Uitvoerende Raad onderneem het om in die nabye toekoms die hele Grondwet te hersien. In die lig daarvan het die Goeie Hoop-Tak nou besluit om ons voorstel dan nie nou in te dien as 'n wysiging waaroor daar nou gestem moet word nie. Ons dien dit egter in as 'n aanbeveling om deur die Uitvoerende Raad in ag geneem te word.

DIE VERKIESING VAN DIE UITVOERENDE RAAD
ELECTION OF EXECUTIVE COUNCIL

MNR. P. J. BOTES, President

Baie dankie mnr. Louw, ons stap dus af van daardie item, en ons kom by die volgende item op ons Agenda. — Election of Executive Council.

U het almal stembriefies, almal wat stemgeregtig is. Dit is in u lêers.

Sal u asseblief dus na aanleiding van mnr. Fraser se verkiesing as Aangewese President, sy naam skrap. Skrap ook mnr. Robson se naam aan-

UITVOERENDE RAAD 1979/1981 EXECUTIVE COUNCIL

Sittende L na R/Seated L to R:
Rld./Clr. Carel Venter, rld./Clr. Hennie Hugo, mnr./Mr. Wessel Barnard, mnr./Mr. Piet Botes (President), rld./Clr. A. K. L. Shepstone, mnr./Mr. Bennie van der Walt (Sekretaris/Secretary), rld./Clr. R. L. de Lange, mnr./Mr. K. G. Robson, mnr./Mr. J. K. von Ahlften.
Staande L na R/Standing L to R:
Mnr./Mr. J. A. Loubser, rld./Clr. L. J. Swart, mnr./Mr. E. de C. Pretorius, rld./Clr. Prof. P. J. Botha, mnr./Mr. D. C. Palser, rld./Clr. B. Steyn, mnr./Mr. A. H. L. Fortmann, mnr./Mr. J. D. Dawson, rld./Clr. E. Gouws, mnr./Mr. W. Bozyczko.
Afwesig/Absent:
Mnr./Mr. D. H. Fraser (President Elect/Aangewese President), rld./Clr. A. H. Honikman, rld./Clr. T. Hen-Boisen.

gesien die verandering aan die Grondwet nou beteken dat die Uittredende President outomaties Lid van die Uitvoerende Raad word.

Mnre. Bozyczko en Dawson is dus ook nou onbestrede verkies op die Uitvoerende Raad, en u hoef dus nie meer vir hulle te stem nie.

U moet dus net vir ses persone stem uit die orige sewe kandidate wat beskikbaar is.

As gevolg van die verandering aan die Grondwet vir die verkiesing van die Uitvoerende Raad is daar 'n paar ander here wat ook nou stemreg het.

Ek sal hulle name noem dan kan hulle stembriefies kom haal:

Mnr. Weakley van Cradock
Mnr. Liebenberg van De Aar
Mnr. Liebenberg van Ladybrand
Mnr. H. van Wyk van Lydenburg
Mnr. P. L. du Toit van Orkney
Mnr. C. A. Marais van Parys
Mnr. G. Munro, Transvaalse Raad vir Buitestedelike Gebiede
Mnr. P. A. du Plessis, Wesrandse Administrasie Raad.

Die volgende nominasies is ontvang:
The following nominations were received:

NOORD-WESTELIKE STREEK
NORTH WESTERN REGION

Barnard W. — Johannesburg
Pretorius E. de C. — Potchefstroom

NOORD-OOSTELIKE STREEK
NORTH EASTERN REGION

Fortmann A. H. L. — Boksburg
Loubser J. A. — Benoni
Von Ahlften J. K. — Springs

SUID-WESTELIKE STREEK
SOUTH WESTERN REGION

Murphy K. J. — Somerset West
Palser D. C. — Cape Town

SUID-OOSTELIKE STREEK
SOUTH EASTERN REGION

Bozyczko W. — (Onbestrede/Unopposed)

SUID-SENTRALE STREEK
SOUTH CENTRAL REGION

Dawson J. D. — (Onbestrede/Unopposed)

MNR. P. J. BOTES, President

Dit is met genoeë dat ek die uitslag van die verkiesing van die lede vir die Uitvoerende Raad bekend maak:

Mnre. W. Barnard, E. de C. Pretorius, A. H. L. Fortmann, J. A. Loubser, J. K. von Ahlften, D. C. Palser (onbestrede), W. Bozyczko (onbestrede) en J. D. Dawson (onbestrede).

Ons sê baie dankie aan ons tellers, nl.: mnre. C. J. Voigt, D. C. Plowden, M. Carey, P. Hendley, C. C. Swarts en R. Fuls.

VENUE OF 1980 TECHNICAL MEETING
PLEK VAN TEGNIESE VERGADERING 1980

MR. P. J. BOTES, President

We come to the next item namely the venue of the 1980 Technical Meeting. I believe Dr. Frost from Welkom has something to say on this matter.

DR. D. M. FROST, Welkom

Mr. President, Gentlemen, I would like, on behalf of the City Council of Welkom, to confirm the invitation extended to the organisation in Somerset West last May to hold your Technical Meeting in Welkom.

The last time a conference was held in the Free State was about 16 years ago in Bloemfontein, so I feel it is high time we hosted this AMEU

Technical Meeting again. What we lack in scenic beauty we will have to make up for in hospitality. Of one thing all those attending can be assured, and that is that you will be introduced to the most dynamic, viable and quick growing young city in the Republic. They say that the trouble with laryngitis is that you can only tell your friends about it — the condition — after it has passed.

Now, this also applies to good experiences, if one does not attend, one only hears about events after they have happened. I hope that all those present, who are entitled to attend the 1980 Technical Meeting will, therefore, be there to enjoy and learn from the contributions and discussions, which I am sure will be of a continuing high standard offered by the AMEU.

MR. P. J. BOTES, President

Thank you Dr. Frost. Will you convey to your Council our appreciation of this very kind invitation. We are looking forward to being with you next year.

VENUE OF 1981 CONVENTION
PLEK VAN KONVENSIE: 1981

MR. P. J. BOTES, President

The next item will be the Venue of the 1981 Convention.

I believe Councillor A. K. L. Shepstone of Durban would like to say something.

COUNCILLOR A. K. L. SHEPSTONE, Durban

Mr. President, I would like to associate myself with remarks of other speakers in congratulating you on your election as President of this Association.

When I arrived this morning, I made myself comfortable over on that side of the hall, and no sooner was I there when Mr. D. Fr. D. Frazer came to me and said, won't you join me on this side of the hall?, so at extreme inconvenience I got up and trekked right across to this side, and no sooner had I made myself comfortable here when he got up and joined the babes in the wood on the stage. So it did'nt all go very well for your start Dennis, anyway I also would like to congratulate Dennis on being elected as President-Elect and to thank him for leaving me alone in this big hall.

Mr. President, on behalf of the City Council of Durban, the Premier City of South Africa, I extend a cordial invitation to your Association to hold your 47th Convention in 1981 in the pearl city of the Indian Ocean.

Your serious business can be catered for at various venues, you can either have a Mexican atmosphere at the Cabana Beach Hotel, or you can have an Oriental style Convention at the Maharani or you can even have a Zulu style at the Elangeni.

For relaxation we can offer you a dam infinitely bigger than the pool you have here on the Vaal River, and for entertainment our beaches are infested with bikini-clad girls. These you can enjoy from your hotel verandah. So, Mr. President, if you choose wisely, I would remind you when you come to Durban to bring your wives or/and girlsfriends, your money and your binoculars.

Thank you.

MR. P. J. BOTES, President

Thank you Councillor Shepstone for the kind invitation. Durban will always meet with the approval of everybody. Kindly convey to your Council our appreciation, we are looking forward to being with you, and to what you have in store for us at the Convention in Durban.

GREETINGS/GROETE

Dr. R. B. ANDERSON, President — S.A.I.E.E.

Greetings Mr. President on your election to the Presidency of this Association from the Institute of Electrical Engineers. I am sure you will have a very successful two years of office. Thank you.

MR. P. J. BOTES, President

Thank you very much Dr. Anderson.

MNR. J. K. VON AHLFTEN, Springs

Meneer die President, as President van SANKV wil ek u graag geluk wens met die verkiesing vandag. Ek wil die vertroue uitspreek dat u twee baie suksesvolle jare sal hê en ek sien uit na goeie samewerking tussen die VMEO en SANKV. Nogmaals baie geluk met die verkiesing.

MNR. P. J. BOTES, President

Baie dankie mnr. von Ahlften.

MR. K. G. ROBSON, East London

Mr. President, Honorary Member Bert Kipling, has asked me to convey a message to this Convention which I do with pleasure:

"Due to a family commitment I am unable to attend the Conference. Will you, therefore, please convey my sincere regrets and apologies. Will you also please express my congratulations to Piet Botes and Dennis Fraser on their elevation to the offices of President and Vice President respectively. May their terms of office prove to be most interesting and rewarding.

The grapevine informs me that Bob Barton and Councillor Hennie Hugo will have Honorary Membership conferred on them, as long serving members of the Executive, and having rendered dedicated service to the Association, the honour is well merited. I trust they may long be spared to treasure the award.

With every good wish for a successful Conference."

MR. P. J. BOTES, President

Thank you Ken; will you convey our thanks to Bert Kipling please.

MNR. & MEV. H. THERON, Vanderbijlpark (Per brief)

Die President, Burgemeester en Sekretaris VMEO, Roodepoort.

"Geagte Mneere, — Ons wil u van harte bedank vir die wonderlike kongres en vir alles wat u gedoen het om vir ons die aangename tyd te verseker. Beide Hawie en ek stel al u moeite ten volste op prys. Ons besef wat so 'n puik Kongres behels en dit sal altyd 'n soete herinnering bly. Dra ook asseblief my opregte dank en waardering oor aan die Burgemeesteres. Die dames het so welkom gevoel.

Met al ons beste wense vir die toekoms."

MR. S. J. VENTER, I.M.T.A. (By letter)

"Mr. President, ladies and gentlemen, on behalf of the Institute of Municipal Treasures and Accountants South Africa I wish to offer the heartiest congratulations on your election. May your term of office bring new impetus to your distinguished Association.

Your Presidential Address balances the past with the future. You quite rightly pointed out that we have to be prepared for the future.

I am in agreement with you that, with the limited resources available to us, it is necessary that we look at alternatives and ensure the best and most efficient use of our resources — specially human resources and expected limited capital. The correct pricing policy within each local community and for the Country as a whole will ensure a more rational use of our resources. The foregoing implies sophisticated accounting systems based on sound economic policy. In conclusion may you have a successful Convention."

DIREKTEUR EN PERSONEELDEPARTEMENT, Universiteit Stellenbosch (Per telegram)

"Van harte geluk met u verkiesing tot President van die Vereniging van Munisipale Elektrisiteitsondernemings van Suid-Afrika. Voorspoed vorentoe."

Rdl. VIVIAN STRYDOM, Uitenhage (Per telegram)

"My beste wense vir 'n geslaagde Konvensie en gelukkige ampstermyn vir jouself. Jammer dat ek nie teenwoordig kan wees. Vriendelike groete."

INGENIEURSBOODSKAP VAN S.A. (Per telegram)

"Beste wense vir 'n voorspoedige Konvensie."

LEWENSSKETS

Mnr. J. L. Rothman het sy skoolopleiding in Vrede ontvang waar hy matrikuleer in 1943. Hy verwerf die B.Sc. (Electriese Ingenieurswese) in 1948 aan die Universiteit van Stellenbosch. Hy is 'n professionele Ingenieur wat by Evkom begin werk het reeds in 1949.

Tussen 1953 en 1955 het hy by die munisipaliteite van Vrede en Ficksburg gewerk as Elektrotegniese Ingenieur, waarna hy terug is na Evkom en waar hy gevorder het tot Senior Bestuurder (Nuwe Werke) by die Hoofkantoor.

Mnr. Rothman is getroud en het 3 dogters. Sy belangstelling is in musiek, fotografie en sport.

DIE ROL VAN PRODUKSIEBATES IN ELEKTRISITEITSVOORSIENINGS-ONDERNEMINGS

deur J. L. ROTHMAN
Pr. Ing., B.Sc., B.Sc. (Ing.)

INLEIDING

Hierdie is nie 'n diepgaande studie van produksiebates nie, maar wel 'n poging om die rol wat produksiebates in 'n elektrisiteitsvoorsieningsonderneming speel te illustreer. Om dit te doen is dit noodsaaklik om die Elektrisiteitsvoorsieningskommissie (EVKOM), wat die grootste elektrisiteitsvoorsieningsonderneming in Suid-Afrika is, as voorbeeld te neem en vas te stel of die beginsels wat deur dié organisasie aangewend word ook toegepas kan word op ander soortgelyke of kleiner ondernemings.

Baie van u mag die term produksiebates lomp vind en daar kan tereg gevra word waarom nie slegs die term 'bate' gebruik word nie. Ek sal egter poog om te beklemtoon dat wat van belang is, is die aspek van produksie en nie slegs bates wat onoordeelkundig aangewend kan word en 'n las vir 'n organisasie kan wees nie. Die konsep is die van produksiebates wat 'n hulpmiddel soortgelyk aan mannekrag en finansies is.

Dit is ook nodig om 'n definisie sowel as 'n klassifisering van produksiebates te gee en aan te dui waar hierdie funksie in die organisasie uitgevoer word. Ten einde dit te kan doen, word daar verwys na die organisasiestruktuur en die spesifieke posisie van hierdie funksie in die organisasie. Daar word afgelei dat indien hierdie funksie 'n betekenisvolle rol in 'n korporaatorganisasie soos EVKOM speel, dit 'n ewe betekenisvolle rol in kleiner elektrisiteitsvoorsieningsondernemings vervul. Die basiese beginsels is toepaslik in alle gevalle.

DEFINISIE EN KLASSIFIKASIE

Dit is moeilik om 'n eenvoudige definisie van produksiebates te gee. Dit is egter betekenisvol om in breë trekke te verwys na die basiese hulpmiddels algemeen bekend as finansies, mannekrag en materiaal en in dié sin die materiaalgedeelte as die allesomvattende konsep van produksiebates te beskou. Produksiebates is die kollektiewe benaming vir alle roerende en onroerende bates wat produktief aangewend word deur die elektrisiteitsonderneming om elektrisiteit op te wek, oor te bring en te versprei, binne die doelstellings van die spesifieke onderneming. Dit is duidelik dat hierdie 'n kollektiewe benaming is wat 'n wye spektrum van bates behels.

'n Klassifisering van produksiebates help om die rol of funksie wat hierdie bates veronderstel is om te vervul te verstaan. Die klassifisering wat deur EVKOM aanvaar en gebruik word, word aangedui in Aanhangsels 1 tot 9. Hierdie bates word afgesien van verdere indeling, op hoë vlak geklassifiseer as grond, regte, produksie-installasies, geboue en fasiliteite, produksietoerusting en materiaal. Die volgende definisies geld vir elk van hierdie hoëvlak kategorieë:

Grond

Alle grond wat deur EVKOM besit word tesame met alle reële regte en persoonlike regte in verband met sodanige grond.

THE ROLE OF PRODUCTION ASSETS IN ELECTRICITY SUPPLY UNDERTAKINGS

by J. L. ROTHMAN
Pr. Eng., B.Sc., B.Sc. (Eng.)

INTRODUCTION

This is no in-depth analysis of production assets but an attempt to illustrate the role that production assets is playing in electricity supply undertakings. To be able to do this, it is necessary to take the Electricity Supply Commission (ESCOM), which is the largest organisation of its kind in South Africa, as an example and determine to what extent the principles illustrated could be applicable to other similar or smaller undertakings.

To many of you the term production assets may sound somewhat unwieldy and you may ask why I do not refer merely to assets. I will show that the operative word is production and not merely assets, which may be a "liability" to an organisation. The concept is that of assets being a resource similar to resources such as manpower and finance.

It is also necessary not only to define and give a classification of production assets as such, but also to illustrate where this function is executed in the organisation. It is therefore necessary to refer to the organisation structure and the position of the production assets function in the organisation. It will be concluded that if this function has a meaningful role to play in a corporate organisation like ESCOM, it will have an equally important role to play in smaller electricity undertakings. The basic principles involved remain the same in all cases.

DEFINITION AND CLASSIFICATION

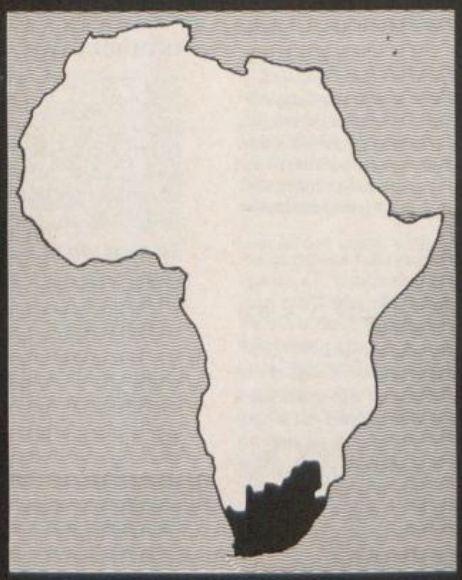
It is difficult to give a simple definition of production assets. A meaningful way is to refer to the concept of basic resource requirements as being 'Money, Men and Material' and to consider the 'Material' part as being the all embracing concept of production assets as such. It could be stated that production assets is the collective term for all fixed and moving assets productively utilized to enable the electricity undertaking to generate, transmit and distribute electricity within the confines of the specific undertakings. As such, it is therefore a collective term covering a wide spectrum of assets.

A classification of production assets helps to understand the role or function that these assets are required to perform. The classification decided upon by ESCOM is illustrated in Appendices 1 to 9. These assets are, apart from further breakdown, classified into the high level categories of land, rights, production plant, buildings and facilities, production equipment and material. The following are the definitions for each of these high level categories:

Land

All land owned by ESCOM together with all ESCOM's real rights and personal rights associated with that land.

Half of all the electricity used in Africa is generated in the South.



South Africa, like all developed countries, expands on a ratio of energy to wealth that can be calculated in units of electricity.

For over 50 years Escom has kept one step ahead of the economy, providing the necessary power for mining, industry, transportation and agriculture, never failing to meet the needs of expansion.

For eight successive years up to 1976, it's average growth rate was better than 9%.

A history of solid returns is reflected in the flow of loan capital provided, both by local investors, and by the attraction of foreign funds to Escom's bonds.

For instance, a recent local loan was oversubscribed by R30 million within a week after opening. In 1976 $200 000 000 was raised through a consortium of international banks.

When you invest in Escom you invest in a power source that grows as irrepressibly as the economy it serves.

Escom, generating wealth.

P.O. Box 1091, Johannesburg 2000.

KMP 2999/R

Regte

Al EVKOM se reële en persoonlike regte in verband met onroerende produksiebates, al EVKOM se regte vir die gebruik van water vir opwekking van elektrisiteit, of vir enige ander gebruik, soos toegeken deur die Departement van Waterwese of ander soortgelyke organisasies aan EVKOM, asook al EVKOM se regte vir die ontginning van steenkoolvelde vir opwekking van elektrisiteit, verkry deur onderhandelinge en notariële ooreenkoms met die eienaar van sulke regte as 'n deel van die steenkoolvoorsieningsooreenkoms.

Produksie-installasies

Alle items wat direk vir die opwekking en voorsiening van elektrisiteit aan die verbruikers aangewend word, insluitende hierdie items se hulptoerusting, siviele werke en die geboue wat hierdie items huisves. Dit sluit ook oorhoofse krane, hysers, roltrappe en soortgelyke items in wat 'n integrale deel van die geboue hierbo vermeld is.

Geboue en Fasiliteite

Alle strukture met dakke en mure wat gebruik word om enige items anders as produksie-installasies te huisves. Dit sluit ook fasiliteite en dienste soos riolering, brandbestryding, afvalverwydering, ontspanningsfasiliteite, eerstehulp, veiligheidsdienste en ander soortgelyke dienste in.

Produksietoerusting

Alle items wat aangewend word vir die bediening van EVKOM se produksie-installasies. Dit sluit toerusting in werkswinkels en in navorsing-, toets- en metallurgiese departemente sowel as in hoofkantoor in, maar sluit nie enige grond, regte, produksie-installasies en materiaal in nie.

Materiaal

Alle items wat verbruiksgoedere, brandstof, strategiese onderdele en strategiese materiaal is, maar sluit al hierdie items uit wat in gebruik is of deel vorm van werke in aanbou.

ORGANISASIESTRUKTUUR

Ten einde die rol wat die produksiebatesfunksie in 'n organisasie speel, na behore te beoordeel, is dit noodsaaklik om na die organisasiestruktuur van sodanige organisasie te kyk. In hierdie verband is die opsommende kaart van die EVKOM-organisasiestruktuur aangedui in Aanhangsel 10. EVKOM funksioneer as 'n korporaatorganisasie en sy aktiwiteite word ingedeel as aktiwiteite wat by sy hoofkantoor in Megawatt Park uitgevoer word, aktiwiteite wat in ses streke uitgevoer word asook aktiwiteite wat deur sy Londense kantoor uitgevoer word.

Dit is belangrik om daarop te let dat EVKOM se organisasie gefundeer is op die konsep van lyn- en stafverhoudings. Die organisasiesegmente te hoofkantoor is die hoofuitvoerende kantoor met die strategiese dienste, die administratiewe dienste, die nuwe werkedienste en die bedryfsdienste as staffunksies vir die hoofuitvoerende kantoor. Die lynfunksies bestaan uit die ses streekfunksies wat elk deur 'n Streekbestuurder hanteer word tesame met die Londense kantoor waar die Bestuurder (Londense kantoor) in beheer is. Die ses streke is soos volg: Rand en Oranje-Vrystaat, Oos-Transvaal, Natal, Wes-Kaapland, Oos-Kaapland en Noord-Kaapland.

Dit is nodig om kortliks aandag te gee aan die organisasie se basiese doelstellings en die uitvoering van die hooffunksies van die organisasie ten einde die geïntegreerde wyse van aanwending van 'n hulpmiddel soos produksiebates te kan verstaan. In die geval van EVKOM word hierdie basiese doelstellings uiteengesit in die Elektrisiteitswet, (Nr. 40 van 1958) en kan as volg opgesom word:

> Die basiese doelstellings van EVKOM is as 'n geïntegreerde organisasie in die verskillende aktiwiteite in verband met die opwekking en verspreiding van elektrisiteit op te tree en te streef na sodanige balans tussen hierdie aktiwiteite sodat 'n goedkoop en voldoende toevoer van elektrisiteit beskikbaar is waar en wanneer dit benodig word.

Hooffunksies:

Ten einde hierdie basiese doelstelling uit te voer, moet EVKOM verseker dat die mees effektiewe gebruik van kapitaal, mannekrag en ander middele gemaak word en moet:

(i) 'n effektiewe, gekoördineerde en ekonomiese stelsel vir die opwekking van elektrisiteit en voorsiening van elektrisiteit in grootmaat aan al sy verspreidingstelsels bedryf en in stand hou;

(ii) effektiewe, gekoördineerde en ekonomiese stelsels vir die verspreiding van elektrisiteit aan sy verbruikers bedryf en in stand hou;

(iii) alle ander funksies uitvoer wat nodig is om hierdie twee genoemde primêre doelstellings te bereik, naamlik:

Rights

All ESCOM's real rights and personal rights related to ESCOM's immovable Production Assets, all ESCOM's rights to the use of water for power generation or for any other use as granted by the Department of Water Affairs or other bodies to ESCOM and all ESCOM's rights to the exploitation of a coal field for power generation purposes by ESCOM, obtained by negotiation and notarial agreement with the owner of such rights and expressed as a part of the coal supply agreement.

Production Plant

All items used directly for the generation and supply of electricity to the consumers, including their auxiliary services, civil works and the buildings housing the Production Plant. It also includes gantry cranes, lifts, escalators and the like which are an integral part of the buildings which are included above.

Buildings and Facilities

All structures with roofs and walls used to contain anything other than production plant. It includes facilities and services such as sewage, fire service, refuse disposal, recreation facilities, first and and safety services and the like.

Production Equipment

All items used for servicing ESCOM's Production Assets. It includes equipment in workshops and also in research, test and matellurgical departments and in head office, but excludes any items in land, rights, production plant and material.

Material

All items included in consumables, fuel, strategic spares and strategic material but excluding all those items which are in commission or are part of work in progress.

ORGANISATION STRUCTURE

To be able to appreciate the role the production assets function plays in an organisation, it is necessary to take a look at the structure of that organisation. In this respect the summary chart of the ESCOM structure is indicated in Appendix 10. As a corporate organisation the activities of ESCOM are divided into activities being performed at its head office in Megawatt Park, the activities performed in the six regions and the activities performed by its London Office.

It is important to note that the ESCOM organisation is based on the concept of line and staff functional relationships. The segments at head office are the chief executive office with the strategic services, the administrative services, the new works services and the operations services on staff to the Chief Executive Office. On line to the Chief Executive Office are the six regions each headed by a Regional Manager and the London Office headed by the Manager (London Office). The six regions are as follows: Rand and Orange Free State, Eastern Transvaal, Natal, Western Cape, Eastern Cape and Northern Cape.

It is necessary to look briefly at the organisation's basic objectives and the performance of the major functions to understand the integrated manner of the utilization of resources such as production assets. In the case of ESCOM the basic objective is set out in the Electricity Act (No. 40 of 1958) and may be summarised as follows:

> The basic objective of ESCOM is to engage, as an integrated concern in various activities involved in the generation and distribution of electricity, striving for such balance between these activities as to ensure a cheap and abundant supply of electricity where and when required.

Major Functions:

In carrying out its basic objective, ESCOM will make the most effective use of capital, people and other resources and will:

(i) operate and maintain an efficient, co-ordinated and economical system for the generation and supply of electricity in bulk to all distribution systems;

(ii) operate and maintain efficient, co-ordinated and economical systems for the distribution of electricity to its consumers;

(iii) carry out other functions which are necessary to enable it to achieve the two previous primary goals, i.e.:

— die handhawing van 'n voldoende opgeleide mannekrag om hierdie funksies na behore uit te voer;

— die verkryging van die nodige installasies en toerusting (produksiebates) by wyse van aankoop of huur of die oprigting van sodanige installasies en toerusting;

— die verkryging van lenings om die koste van die verkryging van installasies en toerusting te dek;

— die daarstelling en instandhouding van voldoende en gekoördineerde administratiewe en logistieke dienste vir die uitvoering van al die voornoemde funksies;

— die ontwikkeling en instandhouding van 'n aktiewe navorsingsprogram wat daarop gemik is om 'n verbetering van die manier en ekonomiteit van bedryf te bewerkstellig.

(iv) hierdie voormelde funksies op 'n etiese wyse en op sodanige manier uitvoer wat sal verseker dat:

— geen wins of verlies gemaak word nie;

— kapitaal en beleggers se fondse voldoende beskerming geniet;

— 'n goedkoop toevoer van elektrisiteit aan verbruikers beskikbaar is;

— die belange van verbruikers voldoende beskerming geniet;

— verbruikers se vertroue gehandhaaf word;

— regverdige vergoeding aan en gesonde werkstoestande vir werknemers gehandhaaf word;

— die nakoming van Staats- en burgerlike verpligtinge verseker word.

Dit is vanselfsprekend dat die organisasiestruktuur wat nodig is om 'n organisasie se basiese doelstellings te verwesenlik afhang van die aard van sy aktiwiteite. Soos aangedui voldoen die EVKOM-struktuur aan die behoeftes om die basiese vereistes vir die opwekking, oorbrenging en verspreiding van elektrisiteit aan sy verbruikers op 'n geïntegreerde wyse deur die aanwending van bates op 'n produktiewe wyse deur die organisasie te bewerkstellig. Elektrisiteitsondernemings wat nie elektrisiteit opwek nie, maar dit in grootmaat aankoop van 'n voorsieningsorganisasie word ook deur hierdie benadering gedek. In hierdie verband sal dit soortgelyk wees aan die geval van die Noord-Kaaplandse streek van EVKOM wat die enigste streek is wat nie elektrisiteit opwek nie, maar dit vanaf die geïntegreerde netwerk ontvang.

DIE PRODUKSIEBATEFUNKSIE

Soos aangedui op die EVKOM opsommende organisasiekaart, word die produksiebatesfunksie op korporaatvlak binne die strategiese dienstesegment uitgevoer. Alhoewel hierdie kaart dit nie aantoon nie, word die nodige produksiebatesfunksie vir die streke binne die middeleverkrygings- en -beheersegmente uitgevoer. Waar dit egter prakties nodig en moontlik is, word hierdie funksie binne die streke na die kragsentrales of die distribusiesegmente gedelegeer.

Net soos in die geval van mannekrag en finansies, behoort produksiebates nie op 'n ongekoördineerde en ad-hoc manier verkry en gebruik te word nie. Daar kan vier stadia in die "lewenssiklus" van produksiebates geïdentifiseer word, naamlik Beplanning, Verkryging of Oprigting, Handelsgebruik en Afval.

Beplanning

Dit is nodig om 'n geïntegreerde en samevattende behoeftes-plan daar te stel vir die kort- en langtermyn produksiebatesbenodigdhede van die organisasie. Dit is noodsaaklik omdat sommige produksiebates in teenstelling met die kort (van die rak af) aflewering van verbruikersgoedere redelike lang tydperke van aflewering het soos in die geval van kragopwekkingsinstallasies. In die geval van EVKOM word in die voorsiening van hierdie behoeftes beplan deur die evaluering van die kort- en langtermynbehoeftes van die streke in die lig van die voorsienings- en oprigtingspotensiaal van die Suid-Afrikaanse sowel as die buitelandse nywerheid.

Verkryging of Oprigting

Hierdie is 'n uiters belangrike en sensitiewe stadium in die lewenssiklus van 'n produksiebate. Dit is waarskynlik die een gebied wat die grootste rede tot kommer vir organisasies is en ook die gebied waar die meeste wanpraktyke kan voorkom. In hierdie stadium word navrae uitgestuur, tenderaanbiedinge ontvang, tenders beoordeel en kontrakte/bestellings vir die aflewering of oprigting toegeken. Gedurende hierdie stadium vind die meeste kontak met leweransiers en oprigters plaas en is dit gebiedend noodsaaklik dat goeie moniteringsprosedures daargestel word.

— to maintain a work force suitably qualified to perform these functions;

— to acquire the necessary plant and equipment (production assets) either by purchase or lease or to construct such plant and equipment;

— to raise loans to meet the cost of acquiring plant and equipment;

— to instal and maintain adequate and co-ordinated administrative and logistic services for all the functions specified above;

— to develop and maintain an active programme of research aimed at improvement of methods and economics of operations.

(iv) conduct the abovementioned functions ethically and in a manner which will ensure:

— no profit or loss;

— a cheap supply of electricity to its consumers;

— protection of consumers' interests;

— consumers' confidence;

— equitable rewards to and good working conditions for employees;

— the fulfilment of governmental and civic obligations.

Needless to say, the structure required to meet an organisation's basic objectives depends on the nature of its activities. As illustrated by the ESCOM structure, the basic requirements of generation, transmission and distribution of electricity to its consumers are met in an integrated manner by the utilization of assets productively throughout the organisation. Electricity undertakings which do not generate any electricity but buy in bulk from a supply authority can well be served by this approach. An example of such an undertaking is the Northern Cape region of ESCOM which is the only region that is not involved in the generation of electricity.

THE PRODUCTION ASSETS FUNCTION

As indicated on the ESCOM summary chart the production asset function at corporate level is executed within the strategic services segment. Although not indicated on the chart, the necessary function in the regions is performed within the resources procurement and control segment. Where practical the function or part thereof is delegated to be performed within the power stations or distribution segments of the regional organisation.

Like personnel and finance, production assets should not be procured and used in an unco-ordinated and ad-hoc manner. Four stages in the "life-span" of production assets are identified, namely Plan, Procure or Construct, Beneficial Use and Scrap.

Plan

It is necessary to have an integrated and summarised requirements plan to cater for the short and long-term requirements of the organisation. This is necessary because of the fact that some production assets have a rather long delivery time e.g. power generation equipment compared to consumable materials which are almost off the shelf supplies. These requirements are planned to be met in ESCOM by obtaining and assessing the needs of the regions and relating these to the capabilities of the industry in the South African as well as the overseas manufacturing and/or construction environment.

Procure or Construct

This is a vital stage in the life-span of an asset and probably the one causing the greatest concern to authorities as it is one exposed to potential unethical practices. This is the stage where enquiries are issued, tenders received and adjudicated and the contract/order for manufacture, delivery or erection awarded. During this stage the greatest amount of contact with the suppliers and erectors takes place and proper monitoring procedures are vitally necessary.

In die geval van EVKOM word navrae deur die produksiebatesfunksie aan goedgekeurde leweransiers, ooreenkomstig die spesifikasies van die Hoof van Nuwe Werke, uitgestuur. In sommige gevalle egter word die spesifikasies deur die gebruikerdepartemente vir meer gespesialiseerde vereistes daargestel. Tenderaanbiedinge word deur die produksiebatesfunksie ontvang en geëvalueer met die kundige bystand van al die ander nodige funksies binne die organisasie. Voorts word die tenderbeoordeling en die kontrak- of bestellingtoekenning binne die magtigingsbevoegdhede soos gedelegeer deur die lede van die Kommissie aan die Tenderraad, die Produksiebatesbestuurder of die Streekbestuurders, gedoen. Streng navolging van hierdie prosedures word verseker deur voldoende oorkoepelende moniteringsprosedures.

In the case of ESCOM enquiries are issued to approved suppliers by the production asset function according to specifications prepared by the Head of New Works. There are, however, other requirements of a more specialised nature, specified by other user departments. Tenders are received by the production assets function and evaluated with the assistance of all other affected segments of the organisation. The tender adjudication done and the contract or order awards placed within the levels of authority delegated by the members of the Commission to the Tender Board, the Production Assets Manager or the Managers of the Regions. Strict adherence to these procedures is enforced by way of the necessary monitoring procedures.

Handelsgebruik

Dit is die stadium waar die produksiebate na aflewering of oprigting beskikbaar is vir voordelige gebruik ten einde die basiese doelstellings van die organisasie te bewerkstellig. Die term 'Handelsgebruik' word vry algemeen vir hierdie stadium gebruik omdat die produksiebate gedurende hierdie stadium produktief aangewend word ten einde inkomste te verseker sodat die rente- en terugbetalingslas gedra kan word.

Beneficial Use (Commercial Operation)

This is the stage where the production assets have been delivered or erected and are available for beneficial use to achieve the basic objectives of the organisation. The term 'Commercial Operation' is commonly used for this stage because during this stage the production asset is utilized to obtain revenue from its use to be able to meet the burden of the interest and redemption charges applicable.

Afval

Aan die einde van die lewe van die produksiebate (hoe hierdie toestand ookal bepaal word) word die bate uit handelsgebruik onttrek en word derhalwe oorbodig in die lig van die basiese doelstelling van die organisasie. In hierdie geval word daar van die oorbodige bate op 'n goedbeheerde wyse ontslae geraak. In die geval van EVKOM word sekere kategorieë van installasies na dit uit diens geneem is, afgetakel, afgeskryf en as afval verkoop terwyl ander bates soos eiendomme of selfs verspreidingsnetwerke deur verkoop aan belanghebbende partye ontslae van geraak word.

Scrap

At the end of the economic life of the asset, (in whatever manner this is determined) the asset is taken out of beneficial use and becomes redundant in terms of the basic objectives of the organisation. At this stage the asset is disposed of in a manner which has, again, to be very well controlled. In the case of ESCOM certain categories of plant are scrapped and sold whilst assets such as estates or even complete distribution networks are disposed of by sale to interested parties.

Dit is duidelik dat die lewenssiklus van 'n produksiebate deur verskillende funksies binne die organisasie sowel as beperkings van buite beïnvloed word. Kortliks kom dit daarop neer dat hierdie siklus begin by die beplanners, daarna word dit beheer deur die aankopers en/of oprigters, waarna dit na voltooiing oorhandig word aan die gebruiker/operateur wat belas is met die bedryf en instandhouding van sodanige bate gedurende sy ekonomiese bruikbare leeftyd totdat dit uiteindelik afgeskryf word en as afval of oortollige bate ontslae van geraak word.

It is obvious that the life cycle of a production asset is influenced and controlled by various functions of the organisation as well as restraints and constraints imposed by the environment. In brief, the cycle starts with the planners, then move into the control of the erectors/suppliers who, after completion, hand the asset over to the user/operator who has to operate and maintain it until eventually it ends up as scrap.

PRODUKSIEBATES FUNKSIONELE OPSOMMENDE ORGANISASIEKAART (EVKOM)

Die opsommende organisasiekaart vir die korporaat produksiebatesfunksie word in Aanhangsel 11 aangetoon. Soortgelyke funksionele organisasiekaarte word in die streke gebruik vir die uitoefening van die funksie binne gedelegeerde magte.

Van hierdie kaart is dit duidelik dat die Hoof van Produksiebates drie lynfunksies en een staffunksie het om hierdie funksie na behore te kan uitvoer.

Die lynfunksies bestaan uit die daarstelling van kontrakte en/of bestellings vir die lewering van installasies, toerusting, materiale en dienste saam gegroepeer as een funksie. 'n Volgende funksie is dié van die verkryging van eiendomme bestaande uit alle grond en verbeteringe asook alle regte tot onroerende bates. 'n Derde, dog ewe belangrike funksie is die verkryging van die nodige brandstof en watervoorsieningsooreenkomste. Die beplannings- en beheerstaffunksie voorsien alle stelsels vir die beheer oor die verkryging van produksiebates en die daarstelling van hulpdienste. Belangrik is dat hier ook 'n funksie van beheer oor omgewingsbeplanning is.

Hierdie organisasiestruktuur voldoen aan die behoeftes vir die georganiseerde verkryging van produksiebates en stel tegelyk ook prosedures vir die beheer van sodanige bates ná verkryging daar. Hierdie funksie hanteer alle versoeke vir verkryging, reik navrae aan goedgekeurde leweransiers uit, ontvang tenderaanbiedinge en dra sorg dat tenderevalueringverslae voorberei word. Voorts doen hierdie funksie die nodige tenderbeoordeling binne die gedelegeerde verantwoordelikheid of verseker dat hierdie tenderbeeling òf deur die Tenderraad òf deur die Kommissie gedoen word, en onderhandel en plaas kontrakte en bestellings na sodanige tenderbeoordeling. Gedurende die uitvoering van die kontrakwerke wat deur die nuwe werke-funksie hanteer word, behou die produksiebatesfunksie die kontraktuele beheer en dra sorg dat sodra die bate in handelsbedryf geneem word 'n wyse van beheer uitgeoefen word deur die daarstelling en handhawing van 'n register van alle EVKOM-produksiebates. Ek sal u nie in hierdie stadium verveel met die ingewikkelhede van hierdie produksiebatesregister nie, dog wil meld dat in hierdie verband EVKOM se register alle data soos naam, plek, datum, waarde, gebruikskoerse, ens., bevat.

Origens voorsien hierdie funksie alle versekeringsdienste wat die oprigtingsstadium sowel as die handelsgebruikstadium van enige produksiebates dek en handhaaf ook 'n produksietoerustingsterkte waarvolgens die verkryging van toerusting soos byvoorbeeld voertuie streng gekontroleer word.

PRODUCTION ASSETS SUMMARY ORGANISATION CHART (ESCOM)

The Summary Organisation Chart of the corporate production assets function is illustrated in Appendix II. Similar functional organisation charts are used within the regions to execute the function within the delegated authorities.

From this chart it is obvious that the Head of Production Assets has to perform three line functions and one staff function to enable him to execute the production assets function in a meaningful manner.

The line functions consist of the establishing of contracts and/or orders for the supply of plant, equipment, materials and services grouped as one related function. A second function is that of the procurement of properties consisting of all land and improvements together with all rights to fixed assets. A third, yet very important function is the procurement of fuel and water. The planning and control staff function provides all systems necessary for the control over the procurement of a production asset and the subsequent provision of control services. Most important is that the function of control over environmental impact is also executed in this area.

This organisation structure meets the requirements for the procurement of production assets and the control of such production assets. This organisation handles the requests for procurement, issues enquiries to approved suppliers, receives tenders, and has the tender evaluation reports prepared. It further either does the adjudication within its authority or has this done by the Tender Board or the Commission and concludes the contracts and orders after such tender adjudication. While the contract work is being supervised by the New Works organisation, the Production Assets organisation maintains the contract control and once the asset is taken into commercial operation it provides a control service by keeping a register of all ESCOM production assets. I will not bore you with the intricate details of this register, but would like to mention that in the ESCOM context this register indicates such data as name, place, date, value, usage rates, etc.

In addition, this organisation supplies all insurance services to cater for assets during construction and assets in beneficial use. It furthermore maintains an equipment establishment by which the procurement of equipment such as vehicles is controlled.

OMGEWINGSINVLOEDBEHEER

Daar is bra min mense vandag, en dit geld ook in Suid-Afrika, wat nie in een of ander mate bewus is van die omgewing nie. Dit is belangrik om bewus te wees van die mate van subjektiwiteit wat daar in hierdie uiters sensitiewe onderwerp aan die dag gelê word. Dit is jammer dat daar in lande soos Amerika en Australië, om nie eers van sommige Skandinawiese lande te praat nie, so 'n geweldige oorreaksie in hierdie verband is dat daar verdere energiekrisisse geskep word, nie as gevolg van tekorte aan energiebronne nie, maar weens die bykans onmoontlikheid om sodanige bronne te ontgin.

EVKOM erken die belangrikheid van omgewingsbeplanning. Daar is derhalwe 'n koördineringsfunksie binne die beheergebied van die produksiebatesfunksie daargestel om toe te sien dat die nodige skakeling binne EVKOM sowel as na buite met alle liggame, owerhede en departemente betekenisvol gedoen word. Weens die feit dat omgewingsaangeleenthede 'n belangrike oorweging in die beplanning van EVKOM se uitbreidingsbehoeftes word, is dit noodsaaklik dat daar gewaak word teen 'n oorreaksie. Gereelde skakelvergaderings word derhalwe gehou met organisasies soos die Departement van Beplanning en die Omgewing, die Departement van Gesondheid, die mynbousektor, die landbousektor en talle ander soortgelyke instansies.

Dit is 'n hoogssensitiewe gebied aangesien dit vanselfsprekend is dat die aktiwiteite van enige elektrisiteitsonderneming en derhalwe ook dié van EVKOM bydra tot visuele, lug-, geraas-, water- en omgewingsbesoedeling in die algemeen. Daar moet egter onthou word dat die omgewing die bestaan en die verdere ontwikkeling van die beskawing moet dra en kan voortgaan om dit te dra. Dit is derhalwe nodig om op 'n verantwoordelike wyse dit wat die omgewing hiervoor bied aan te wend en terselfdertyd te waak teen uitbuiting.

'n Betekenisvolle balans moet in hierdie verband in alle gevalle gehandhaaf word. Daar moet in aanmerking geneem word dat bykans enigiets vandag tegnies moontlik is, maar wel teen 'n prys. Die pragtigste projekte kan ontwikkel word indien koste geen oorweging is nie, maar daar moet in ag geneem word dat die verbruikers nie beindruk sal wees deur sodanige benadering nie.

GEVOLGTREKKING

Ek het probeer, en hoop dat ek in 'n mate daarin geslaag het, om die uiters belangrike rol wat produksiebates in alle elektrisiteitsopwekking en/of -voorsieningsondernemings speel, uit te beeld. Die feit dat ek die ondervinding wat deur EVKOM in hierdie verband opgedoen is in die vestiging en uitbouing van hierdie funksie as verwysing gebruik, beteken geensins dat hierdie funksie slegs in EVKOM se geval 'n belangrike rol vervul nie. Ek is oortuig dat almal vandag hier teenwoordig in een of ander mate 'n belang in die elektrisiteitsvoorsieningsnywerheid het en dat die produktiewe aanwending van bates dus vir u van besondere belang behoort te wees.

Van kernbelang is die feit dat 'n produksiebate 'n lewenssiklus bykans soortgelyk aan dié van die mens het. Hierdie siklus begin in die beplanningsstadium wat gevolg word deur die voorbenuttingsstadium, waarna die bate in handelsgebruik produktief aangewend word om later, nadat dit 'n nuttige diens vir die organisasie verrig het, afgeskryf te word. Soortgelyk aan die mens gebeur dit dat daar gedurende hierdie lewenssiklus ongelukke plaasvind. Dit gebeur deurdat 'n produksiebate ernstig beskadig kan word of in sommige gevalle as gevolg van veranderde omstandighede oorbodig kan raak.

Ek het probeer om die belangrikheid van die doelmatige beplanning om in die behoeftes van die organisasie te voorsien, die verkryging van die nodige produksiebates in 'n streng beheerde omgewing, die effektiewe aanwending van sodanige bates en in die finale stadium die afskryf en ontslaeraking van oortollige bates in 'n ewe streng beheerde omgewing te benadruk. Ek hoop van harte dat ek geslaag het in my doelstelling.

DANKBETUIGING

Graag wil ek hiermee my dank aan die Bestuur van EVKOM betuig vir die geleentheid om hierdie referaat aan u te kon lewer. Dit is vir my 'n besondere voorreg omdat ek persoonlik baie nou gemoeid en betrokke was by die daarstelling van hierdie funksie op 'n geïntegreerde basis in EVKOM en vir ietwat meer as drie jaar Hoof van Produksiebates in EVKOM gefunksioneer het.

Verder ook my dank aan die Vereniging van Munisipale Elektrisiteitsondernemings vir die vertroue in my gestel om hierdie bydrae te kon maak. Onwillekeurig gaan my gedagtes 25 jaar terug toe ek as 'n jong munisipale ingenieur die eerste keer so 'n konvensie in Bloemfontein bygewoon het. Baie water het intussen in die see gevloei, dog afgesien van die feit dat ek in die verre verlede aan die hoof van sodanige organisasies gestaan het, is ek sedert my terugkeer na EVKOM nog altyd in noue verband met die behoeftes van munisipaliteite as sulks.

ENVIRONMENTAL IMPACT CONTROL

There are few people today, and this is also true in South Africa, who are not in one way or the other aware of the environment. It is necessary to be aware of the extent of subjectivity which is prevalent in this field. It is a pity that in countries such as America and Australia, not to mention some of the Scandinavian countries, such an over reaction is taking place that further energy crises are caused, not on account of the shortage of energy resources as such, but due to the near impossibility of exploiting such resources.

ESCOM has recognised the importance of environmental planning. It has therefore established a co-ordinating function within the control of the production assets functional organisation that has to liaise with all ESCOM departments and ensure co-ordination with all external bodies, authorities, etc. In view of the ever increasing importance of the effect of environmental impact on the planning of ESCOM activities, it is imperative that it should be guarded against over reaction. Regular liaison meetings are therefore held with organisations such as Department of Planning and Environment, the Department of Health, the mining, and agricultural sectors, and various other similar organisations.

This is a highly sensitive area because the activities of an organisation like ESCOM can contribute to visual, noise, air, water and environmental pollution in general. It must, however, be accepted that the environment has to sustain further civilization and has to be capable of continuing to do so. It is therefore imperative to urilise what is offered by the environment in a responsible manner and prevent wastage.

A meaningful balance must in all cases be maintained. Almost anything is technically possible today, but at a cost. The most beautiful projects could be developed if costs were of no consideration, but it must be accepted that the consumers will in general not be pleased with such an approach.

CONCLUSION

I have tried, and hope that I have in some way succeeded, to illustrate to you the important role that production assets play in all electricity generation and/or supply organisations. The fact that I have used the experience gained by ESCOM in establishing this function does not mean that this role is of particular importance to ESCOM only. I am sure that almost all of you have in one way or another an interest in the electricity supply industry and as such the effective use of assets in this activity should be of major concern to you all.

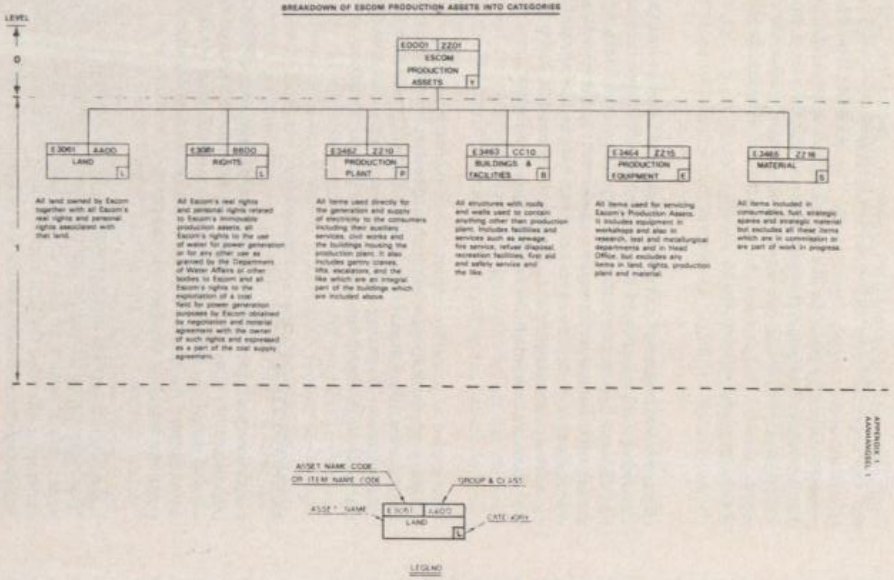
Of paramount importance is the fact that a production asset has a lifecycle almost similar to that of man by starting off in the planning stage to be followed by the pre-beneficial usage stage and finally being 'pensioned' after having performed a useful service to the organisation. Like man, however, in certain cases accidents happen during this lifecycle in as much as sometimes major damage occurs and in other cases assets may become redundant due to changing circumstances.

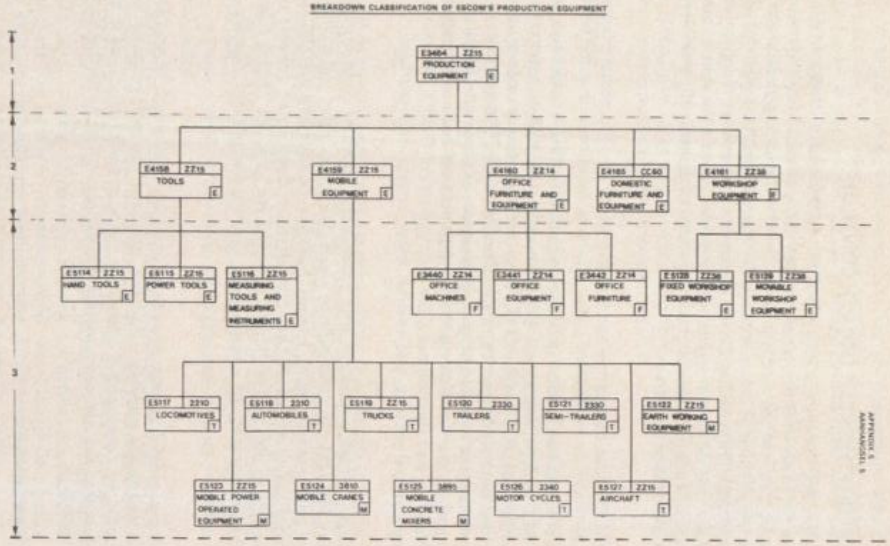
I have tried to stress the importance of planning properly for the needs of the organisation, procuring the necessary production assets in a strictly controlled manner, utilising such assets effectively and in the final situation disposing of these in a strictly controlled manner. I sincerely hope that I have succeeded in my objective.

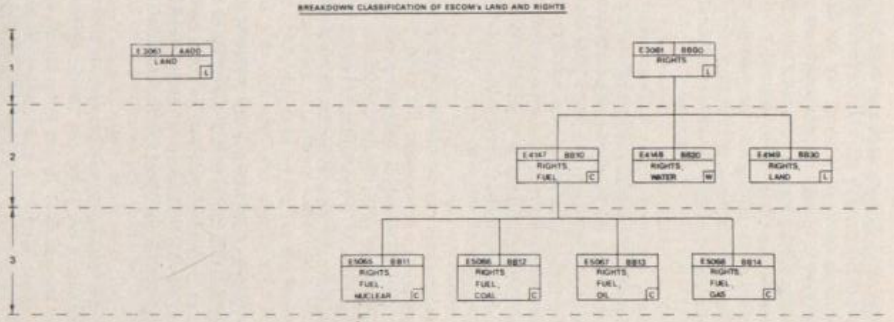
ACKNOWLEDGEMENT

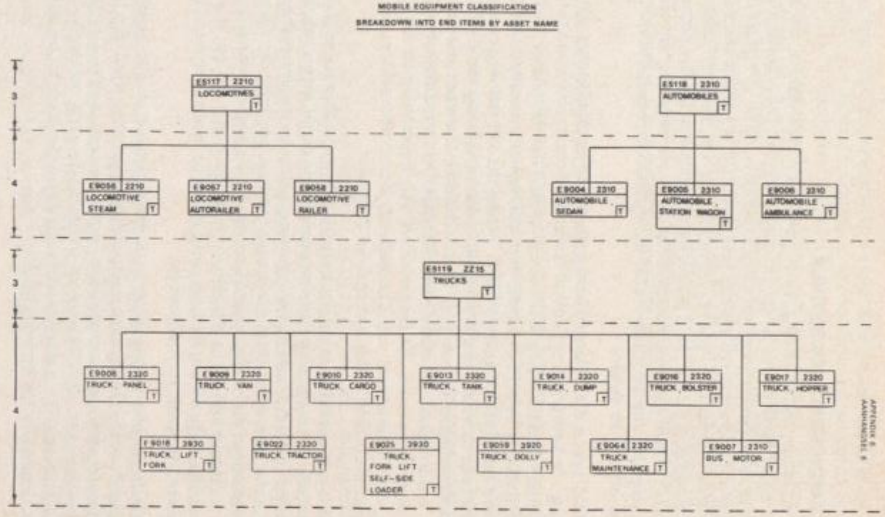
I wish to express my appreciation to the management of ESCOM for the opportunity to present this paper. To me this is a special occasion in view of my personal involvement in the establishment of this function in an integrated manner in ESCOM and since I was for more than three years the Head of Production Assets.

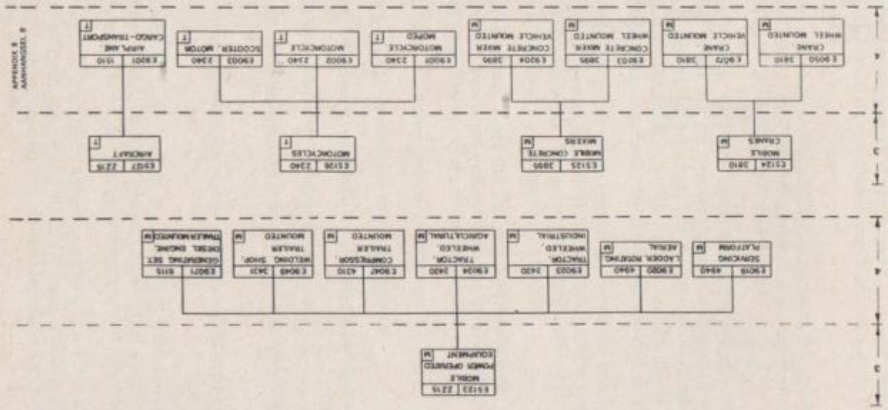
I also wish to express my appreciation to the Association of Municipal Electricity Undertakings for the confidence in asking me to present this paper. My thoughts go back 25 years to when, as a young municipal engineer, I attended the first convention of this nature in Bloemfontein. Much water has flowed under the bridges since then. Yet, although I have been at the head of organisations like these in the past, I have since my return to ESCOM still been involved in the requirements of municipalities.


BREAKDOWN OF ESCOM PRODUCTION ASSETS INTO CATEGORIES
LEVEL
0
1
E0001 ZZ01
ESCOM PRODUCTION ASSETS
Y
E3061 AA00
LAND
L
All land owned by Escom together with all Escom's real rights and personal rights associated with that land.
E3081 BB00
RIGHTS
L
All Escom's real rights and personal rights related to Escom's immovable production assets, all Escom's rights to the use of water for power generation or for any other use as granted by the Department of Water Affairs or other bodies to Escom and all Escom's rights to the exploitation of a coal field for power generation purposes by Escom obtained by negotiation and mineral agreements with the owner of such rights and expressed as a part of the coal supply agreement.
E3462 ZZ10
PRODUCTION PLANT
P
All items used directly for the generation and supply of electricity to the consumers including their auxiliary services, civil works and the buildings housing the production plant. It also includes gantry cranes, lifts, escalators, and the like which are an integral part of the buildings which are included above.
E3463 CC10
BUILDINGS & FACILITIES
B
All structures with roofs and walls used to contain anything other than production plant. Includes facilities and services such as sewage, fire service, refuse disposal, recreation facilities, first aid and safety service and the like.
E3464 ZZ15
PRODUCTION EQUIPMENT
E
All items used for servicing Escom's Production Assets. It includes equipment in workshops and also in research, test and metallurgical departments and in Head Office, but excludes any items in land, rights, production plant and material.
E3465 ZZ16
MATERIAL
S
All items included in consumables, fuel, strategic spares and strategic material but excludes all these items which are in commission or are part of work in progress.
APPENDIX 1
ASSET NAME CODE OR ITEM NAME CODE
GROUP & CLASS
ASSET NAME
E3081 AA00
LAND
L
CATEGORY
LEGEND

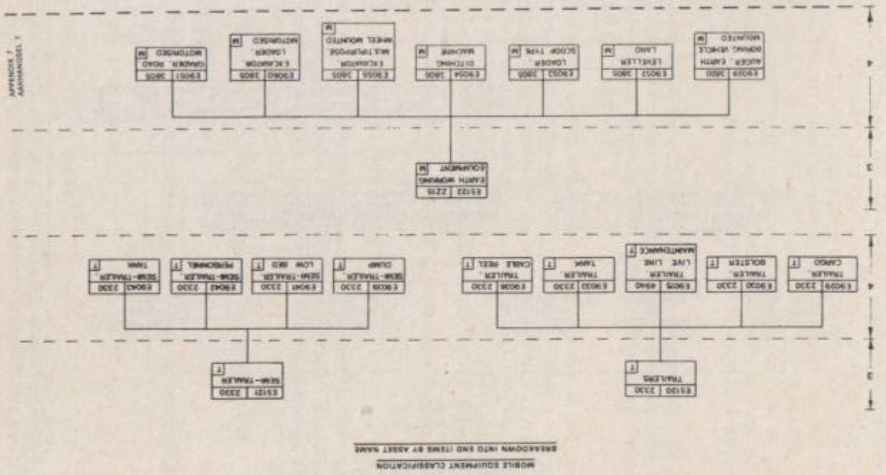

BREAKDOWN CLASSIFICATION OF ESCOM'S PRODUCTION EQUIPMENT
1
2
3
E3464 ZZ15
PRODUCTION EQUIPMENT
E
E4158 ZZ16
TOOLS
E
E4159 ZZ15
MOBILE EQUIPMENT
E
E4160 ZZ14
OFFICE FURNITURE AND EQUIPMENT
T
E4165 CC40
DOMESTIC FURNITURE AND EQUIPMENT
E
E4161 ZZ30
WORKSHOP EQUIPMENT
W
E5114 ZZ15
HAND TOOLS
E
E5115 ZZ15
POWER TOOLS
E
E5116 ZZ15
MEASURING TOOLS AND MEASURING INSTRUMENTS
E
E3440 ZZ14
OFFICE MACHINES
F
E3441 ZZ14
OFFICE EQUIPMENT
T
E3443 ZZ14
OFFICE FURNITURE
F
E5128 ZZ30
FIXED WORKSHOP EQUIPMENT
E
E5129 ZZ30
MOVABLE WORKSHOP EQUIPMENT
E
E5117 2210
LOCOMOTIVES
T
E5118 2310
AUTOMOBILES
T
E5119 ZZ15
TRUCKS
T
E5120 2330
TRAILERS
T
E5121 2330
SEMI-TRAILERS
T
E5122 ZZ15
EARTH WORKING EQUIPMENT
M
E5123 ZZ15
MOBILE POWER OPERATED EQUIPMENT
M
E5124 3810
MOBILE CRANES
M
E5125 3895
MOBILE CONCRETE MIXERS
M
E5126 2340
MOTOR CYCLES
T
E5127 ZZ15
AIRCRAFT
T
APPENDIX 5


BREAKDOWN CLASSIFICATION OF ESCOM's LAND AND RIGHTS
1
2
3
E3061 AA00
LAND
L
E3081 BB00
RIGHTS
L
E4147 BB10
RIGHTS, FUEL
C
E4148 BB20
RIGHTS, WATER
W
E4149 BB30
RIGHTS, LAND
L
E5065 BB11
RIGHTS, FUEL, NUCLEAR
C
E5066 BB12
RIGHTS, FUEL, COAL
C
E5067 BB13
RIGHTS, FUEL, OIL
C
E5068 BB14
RIGHTS, FUEL, GAS
C
APPENDIX 2


MOBILE EQUIPMENT CLASSIFICATION
BREAKDOWN INTO END ITEMS BY ASSET NAME
3
4
E5117 2210
LOCOMOTIVES
T
E5118 2310
AUTOMOBILES
T
E9056 2210
LOCOMOTIVE STEAM
T
E9057 2210
LOCOMOTIVE AUTORAILER
T
E9058 2210
LOCOMOTIVE RAILER
T
E9004 2310
AUTOMOBILE, SEDAN
T
E9005 2310
AUTOMOBILE, STATION WAGON
T
E9006 2310
AUTOMOBILE AMBULANCE
T
E5119 ZZ15
TRUCKS
T
E9008 2320
TRUCK, PANEL
T
E9009 2320
TRUCK, VAN
T
E9010 2320
TRUCK, CARGO
T
E9013 2320
TRUCK, TANK
T
E9014 2320
TRUCK, DUMP
T
E9016 2320
TRUCK, BOLSTER
T
E9017 2320
TRUCK, HOPPER
T
E9018 2930
TRUCK, LIFT FORK
T
E9022 2320
TRUCK, TRACTOR
T
E9021 2930
TRUCK, FORK LIFT SELF-SIDE LOADER
T
E9019 2920
TRUCK, DOLLY
T
E9064 2320
TRUCK, MAINTENANCE
T
E9007 2310
BUS, MOTOR
T
APPENDIX 6

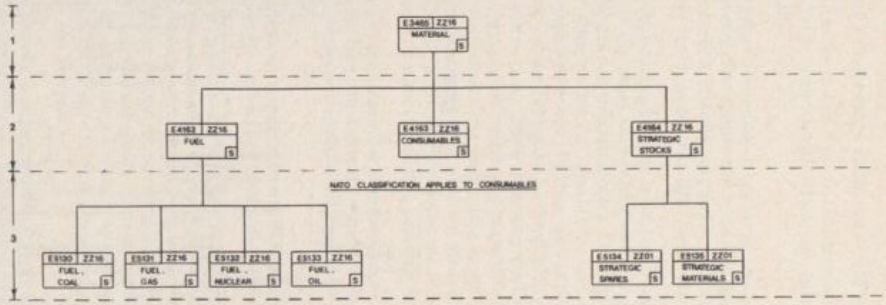


MOBILE EQUIPMENT CLASSIFICATION
BREAKDOWN INTO END ITEMS BY ASSET NAME

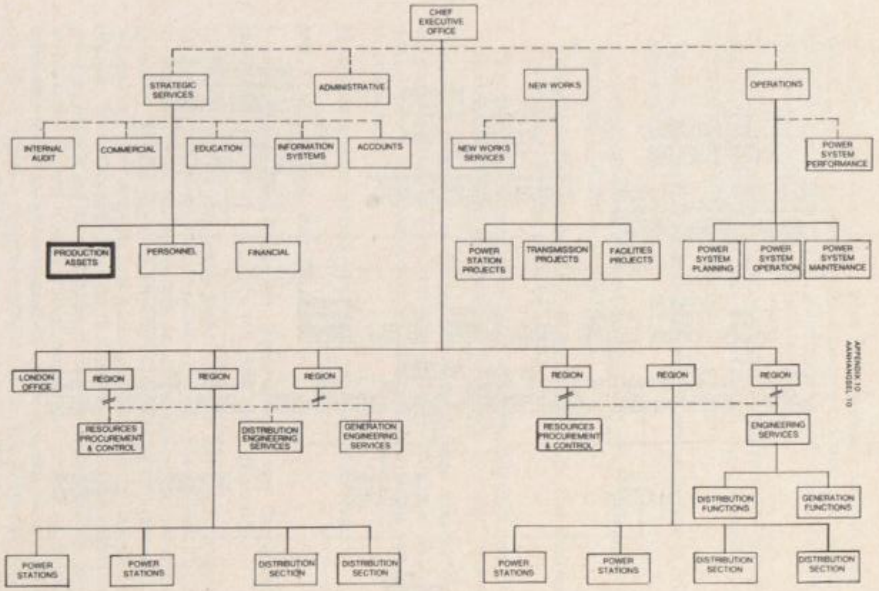


MOBILE EQUIPMENT CLASSIFICATION
BREAKDOWN INTO END ITEMS BY ASSET NAME

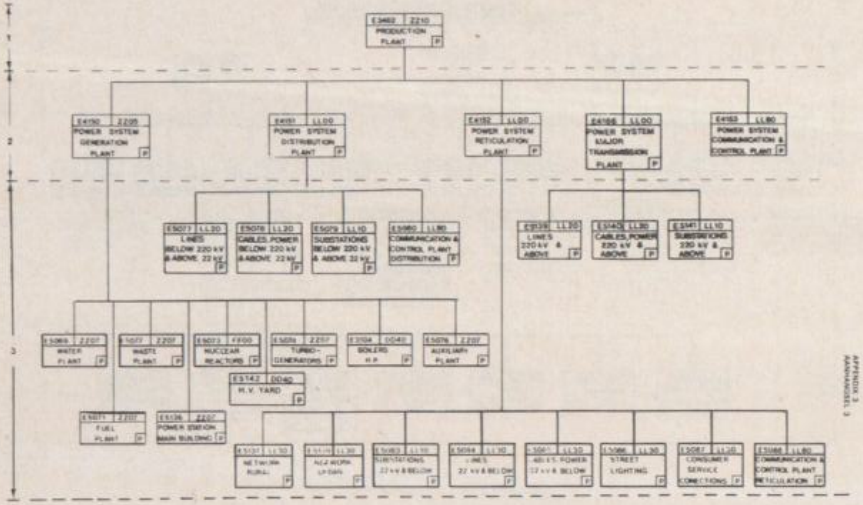
BREAKDOWN CLASSIFICATION OF ESCOM'S MATERIAL



ESCOM ORGANISATION STRUCTURE

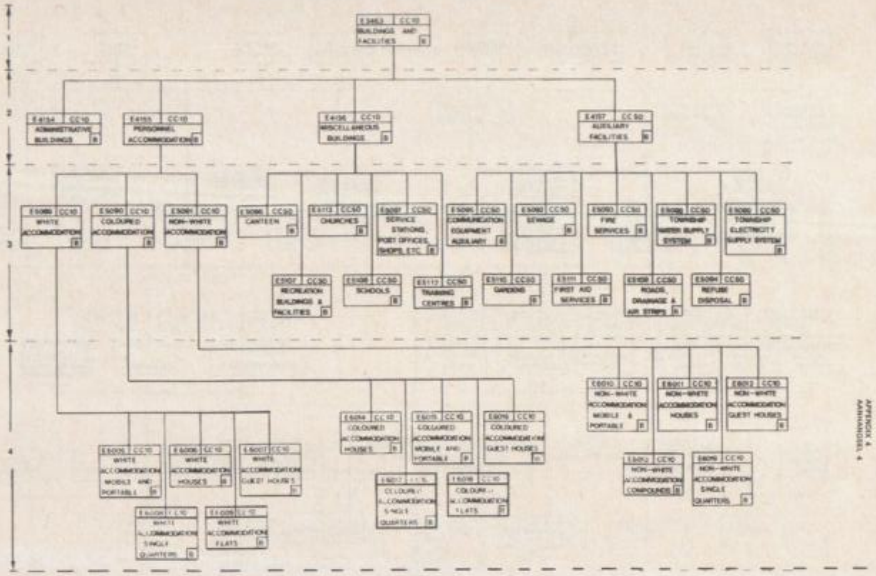


CLASSIFICATION OF ESCOM'S PRODUCTION PLANT



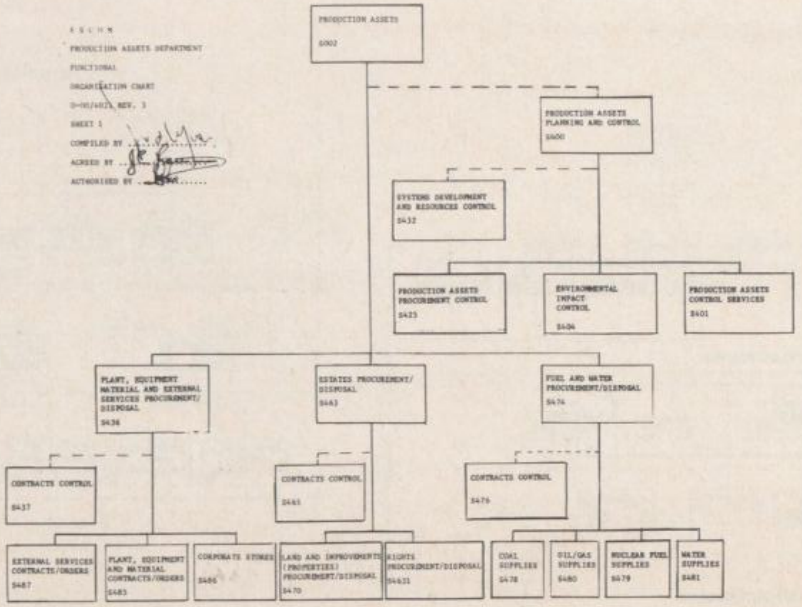
APPENDIX 3
AANHANGSEL 3

BREAKDOWN CLASSIFICATION OF ESCOM'S BUILDINGS AND FACILITIES



APPENDIX 4
AANHANGSEL 4

ESCOM
PRODUCTION ASSETS DEPARTMENT
FUNCTIONAL
ORGANISATION CHART
D-00/1402, REV. 3
SHEET 1
COMPILED BY .....
AGREED BY .....
AUTHORISED BY .....



APPENDIX 11
AANHANGSEL 11

MNR. A. J. VAN DEN BERG: KRUGERSDORP

Produksiebates is een van die produksiemiddele, nl. kapitaal (finansies), arbeid (mannekrag), materiaal (produksiebates) en ondernemingsgees.

Alvorens daar geproduseer kan word moet die produksiemiddele in 'n sekere verhouding aangewend word afhangende van die produk wat geproduseer word. Hierdie verhouding kan ook vir dieselfde produk verskil, maar teoreties bestaan daar slegs een ideale verhouding.

In die hele produksieproses is dit nie net belangrik om die produksiemiddele in die regte verhouding aan te wend nie, maar ook die regte verhouding tussen produksiebates. Dit impliseer dat die bestuur 'n keuse moet uitoefen tussen verskillende alternatiewe. Die belangrikheid van die regte keuse word beklem-toon in die voorbeeld van 'n onderneming waarvan die produksie-eenheid 90% van die gebouekompleks bestaan het terwyl die administratiewe deel slegs 10% in beslag geneem het. Die bestuur het besluit om 'n gesofistikeerde kosteberekeningstelsel in te voer waarna die verhouding verander het na 50 : 50. Na die verandering is die aansienlike wins wat die onderneming voorheen gemaak het omskep in 'n aansienlike verlies met slegs die verskil dat die bestuur presies kon sê waar die verlies ontstaan het.

Die regte keuse tussen die alternatiewe produksiebates is onontbeerlik vir die bereiking van die onderneming se doelwit nl. 'n goedkoop en voldoende toevoer van elektrisiteit daar te stel waar en wanneer dit benodig word.

By die beplanningsfase vind die behoeftebepaling plaas en reeds hier moet die regte verhouding tussen die produksiemiddele oorweeg word.

By die verkryging van oprigting van produksiebates word die keuse uitgeoefen tussen die alternatiewe produksiebates. Die keuse hang af van 'n wye spektrum van faktore, soos byvoorbeeld die invloed op die ekonomie van die onderneming, verhoogde produktiwiteit, besparing in tyd en ander produksiefaktore, betroubaarheid, duursaamheid, skrootwaarde, ens. Die faktore behoort so gekoördineer te word sodat die netto resultaat die doeltreffendste produksie sal wees en derhalwe die laagste koste per eenheid.

Daar is erkende bestuurstegnieke wat die keuse by die aanskaf van produksiebates vergemaklik, bv. die koste voordeel ontleding, "verdiskonteerde kontantvloei" en dies meer.

Sodra 'n produksiebate in bedryf gestel word, is dit die taak van die bestuur om toe te sien dat dit optimaal benut word tot aan die einde van sy leeftyd.

Die belangrike plek wat produksiebates inneem in die onderneming lê daarin dat die foutiewe aanwending daarvan, die doelwit van die onderneming verydel, in die geval, duur elektrisiteit.

Die onoordeelkundige aankoop van produksiebates het onlangs tot gevolg gehad dat 'n kleiner elektrisiteitsvoorsieningsonderneming inderhaas na kopers gesoek het vir ongebruikte, nuwe toerusting — waarvan 'n gedeelte uiteindelik teen 'n verlies ontslae van geraak is, terwyl die wesentlike gevaar van drastiese tariefaanpassings net-net afgeweer is.

Die rol wat voordelige en doeltreffende aanwending van bates in die produksieproses van enige elektrisiteitsvoorsieningsonderneming speel, hou steeds direkte verband met, en is grotendeels afhanklik van die ingenieursvernuf waaroor so 'n organisasie beskik.

Voorafgaande impliseer egter dat die bestuursfunksie t.o.v. die beheer oor produksiebates van uiters belang is om te verseker dat oorvleueling of duplisering van aankope nie kan plaasvind nie.

Miskien kan mnr. Rothman ons meer inlig oor —

(1) verslytbare en nie-verslytbare produksiebates;

(2) besondere eienskappe van slytende duursame produksiebates;

(3) kapasiteit van duursame produksiebates;

(4) tegniese en ekonomiese lewensduur van duursame produksiebates; en

(5) die verloop van die waarde van prestasies van duursame produksiebates.

Now, Mr President, if we look at our own electricity undertaking and evaluate our production assets if comes to mind that much can be done to curtail these assets by proper co-ordination and planning.

Recently a decision had to be taken to uprate two 33/11 kV 20 MVA stepdown transformer stations to 40 MVA each. Adding one 20 MVA transformer at each substation was a sensible solution at a total cost of approximately R220 000.

On studying the situation to look for alternative solutions to the problem taking all available information into account, it was ultimately decided that a 20 MVA 11 kV standby cable system costing R68 000 would be as suitable to uprate both stations.

A technical committee to advise the Council on all technical matters instituted recently has already saved the Council a considerable amount of money on the following projects:

1. Vehicle replacement policy and a study evaluating the type of vehicle for a given job.

2. Co-ordinating new purchases and evaluating which equipment could be shared by different departments.

3. Investigating how redundant production assets in one department can still be of use in other departments.

4. "Pooling" certain production assets of all departments actually indicated that additionally requested items were no longer necessary.

Meneer die President, op die oog af wonder 'n mens soms wat die rol van produksiebates in 'n onderneming speel. Mnr. Rothman het ons geprikkel met sy interessante referaat en ek wil hom graag baie gelukwens daarmee.

Ek wil die spreker bedank vir 'n baie interessante referaat.

MR. C. E. ADAMS, Port Elizabeth:

I would like to congratulate Mr. Rothman on a very timely and interesting paper which I am sure will elicit much discussion.

I think that this is a very timely paper because it will focus our attention on the value of the production assets we use on our systems. The rapid increase in cost of the equipment we use, is making it more and more necessary for us to pay close attention to looking after these assets, and maintaining them properly in order to get the maximum life possible out of them. The paper highlights the fact that we should know what equipment we have in use on our systems — **all** the equipment, not only the major items. Escom is large enough to warrant a separate division to fulfill this function, whereas most of us are not, but we are all large enough to require a comprehensive set of records to provide details of what we have, and what use we are making of it. This is an area to which I feel we all have to pay much more attention.

Mnr. Rothman het genoem dat een van die pligte van die Produksie Bate Afdeling die instandhouding van 'n masjinerie- of bate-register is. So 'n register sal ook gebruik kan word om die waarde van die masjinerie wat geïnstalleer is, vir assuransie-doeleindes vas te stel, 'n probleem wat ons op die oomblik in Port Elizabeth ondervind. My Raad het besluit dat assuransiewaardes in die toekoms gebaseer moet word op die vervangingskoste, en my eerste vraag aan mnr. Rothman is: Werk hulle ook op 'n vervangingskoste basis, en indien wel, hoe word die waardes elke jaar bereken?

Die Organisasiekaart, Bylae 10, wys die Verkryging van Bronne en die Kontrole-afdelings verbonde aan die streekskantore — het die Produksie Bate Afdeling van Megawatt Park lynbeheer oor hierdie afdelings, en hoe word dit toegepas?

The major function of the Production Assets division is the procurement of resources, including plant and equipment. This is a very important function, and I was struck by the apparent absence of a vital component, namely, quality control. This is an aspect which is assuming considerable importance these days, and I would like to ask Mr. Rothman whether Escom has a quality control section in his division.

In conclusion, I would like to thank Mr. Rothman for presenting this paper to us.

MNR. SAREL VENTER, IMTR:

Meneer die President, dit is vir my 'n groot eer om hierdie Konvensie by te woon en ook te probeer om 'n stuiwer in die armbeurs te gooi na aanleiding van Meneer Rothman se deskundige referaat, waarmee ek hom wil gelukwens.

As Stadstesourier het die volgende aspekte by my opgekom:

1.0. BEHEER/KONTROLE:

Die beheer en kontrole oor bates kan gewoonlik in die volgende groepe verdeel word naamlik —

1.1. Massa ("Bulk") Bates;

MNR. SAREL VENTER, IMTR:

Meneer die President, dit is vir my 'n groot eer om hierdie Konvensie by te woon en ook te probeer om 'n stuiwer in die armbeurs te gooi na aan-

leiding van Meneer Rothman se deskundige referaat, waarmee ek hom wil gelukwens.

As Stadstesourier het die volgende aspekte by my opgekom:

1.0. BEHEER/KONTROLE:

Die beheer en kontrole oor bates kan gewoonlik in die volgende groepe verdeel word naamlik —

1.1. Massa ("Bulk") Bates;
1.2. Los Bates (Gereedskap, Meubels, ens.)
1.3. Motor-voertuig en masjinerie Vloot.

Beheermaatreëls behels gewoonlik —
(a) Boekstawing;
(b) Fisiese Beheer;
(c) Versekering; en
(d) Vervangingsbeleid en Finansieringsbeleid.

'n Paar gedagtes:

(a) **Boekstawing**

Plaaslike Besture en Semi-Staats-instansies is reeds "past masters" op dié gebied. Hierdie instansies se Bateregisters is gewoonlik volledig ten opsigte van bates, beskrywing, geografiese ligging, tipe van bates, finansiëring, leeftyd, ens.

Onse vriende, die privaat industrieë het ook 'n paar jaar gelede toe 'n maatskappy-wet dit verpligtend gemaak het, vir geregistreerde maatskappye, bate-registers moes instel wat toe 'n "nuwigheid" vir hulle was.

(b) **Fisiese Beheer**

Die fisiese beheer en instandhouding van bates is die belangrikste aspek. Hier moet ons dan ons aandag bepaal by die duurste of mees produktiewe bates. 'n Beplande voorkomings-onderhoud moet meer volgens hierdie bates gedoen word as daardie wat nie so krities is vir u besondere bedryf nie.

Los bates het 'n geweldige "nuisance value", veral omdat ons ouditeure daarna kyk. Delegasie kan met vrug hier toegepas word. Elke amptenaar kan verantwoordelik gehou word vir sy eie bates. 'n Voorman en toeskouers vir 'n groep, en 'n Seksie-ingenieur vir 'n aantal groepe.

Hierdie beheer moet liefs nie op 'n sentrale punt wees nie.

(c) **Versekering**

Versekering moet op die basis van vervangingswaarde geskied anders kan die betrokke instansie groot verliese ly wanneer daar rampe is.

Hierdie is in praktyk 'n redelik maklike taak indien u gebruik maak van goeie Versekerings Makelaars wat Ingenieurs in hulle diens het. Die polis kan dan ook voorsiening maak vir enige item wat nie ten volle verseker is nie of wat uitgelaat is op die skedule. Inflasie — boekhouding vir die Raad is nie aan te beveel nie.

(d) **Vervangings-/Finansieringsbeleid**

Hierdie is 'n geweldige groot onderwerp wat meer en meer aandag geniet. Die jongste tendens is dat hernuwingsbates in baie gevalle onbenut lê en wanneer 'n nuwe bate geskep word, is daar 'n dubbele las, naamlik leningsdelging en rente en bydrae tot hernuwingsfonds. Slegs lenings is 'n konstante koste wat die ekonomiese koste van die bates aandui. Korter leningstermyne word ook nou meer algemene praktyk.

2.0. BENUTTING

Beplande opname kan van tyd tot tyd gebruik word om te verseker dat ons bates maksimaal benut word en tweedens of bates nie al verouderd of uitgedien is nie en dat onderhoudskoste in elk geval meer is as die rente en delging op die lening vir 'n nuwe bate.

Die doelbewuste operasionele oudit elke drie tot vyf jaar is gewens om hierdie feite te bepaal. Die ander aspek is die grootte van die kapitale uitleg vergeleke met die verkope. In reële terme byvoorbeeld, wat is die koste per megawatt uur verkoop teen 1970 pryse? Of megaliter water verkoop of megaliter riool verwerk?

Spreker het 'n tyd gelede 'n berekening gemaak ten opsigte van 'n paar Nuts-maatskappye en het gevind dat in die een geval die kapitale uitleg per eenheid verkoop sedert 1950, (met 1950 gelyk aan 100) het dit na 113 in 1978 gestyg, dit wil sê, hierdie besondere Nuts-maatskappy se kapitale uitleg per eenheid verkoop teen 1970 pryse, het slegs met 13 persent toegeneem.

Dit is sekerlik 'n bewys dat die kapitale uitleg nou verband hou met verkope.

In 'n ander geval het die kapitale uitleg gestyg vanaf 'n 100 indeks 1950 tot 171 in 1978. In hierdie geval kon die dienslewering beter gewees het of baie ander faktore kon daartoe bygedra het maar die moontlikheid is ook dat die kapitale uitleg vinniger gegroei het as verkope, of 'n kombinasie van faktore. 'n Deeglike ondersoek is in so 'n geval nodig.

Omdat ons land so 'n groot tekort aan kapitaal het, rus daar 'n dure plig op elkeen van ons se skouers om kapitale uitlegte te beperk tot die absolute noodsaaklike.

Die onlangse aanbevelings van die De Kock Kommissie mag help maar dit word betwyfel. Die sogenaamde finansiële rand wat 'n oorspronklike diskonto van 42 persent gedra het (is nou 30%), beteken dat 'n buitelandse belegger 'n bate (bv. effekte) teen 'n groot diskonto kan koop. Ek is egter van mening dat dit nie 'n kapitale invloed vir R.S.A. gaan beteken nie. Ons sal dus maar moet skraps werk met ons geldjies uit die kapitale fondse.

Weer eens, Meneer die President, baie dankie vir die geleentheid om 'n klein bydrae te maak, indien dit vir u van nut kan wees en geluk mnr. Rothman, met u insiggewende referaat.

MNR. J. L. ROTHMAN, EVKOM:

Meneer die President, òf ek het die mense voldoende ingelig, wat ek betwyfel, òf dit het nie die nodige impak gehad nie. In elk geval, ek sal probeer om te antwoord op die paar vrae wat gevra is.

Eerstens, wat die paar idees van mnr. v.d. Berg betref. Ek stem saam met wat hy gesê het in sy relaas. Ek stem ook saam met wat hy uitgelê het, en dit is dat ons in hierdie dae van hoë kostes baie versigtig moet wees en op 'n goed beplande basis te werk moet gaan sodat ons die nodige optimisering kan doen van al ons middele en dit sluit in produksiebates sowel as finansies en die mannekrag wat daarmee saamgaan.

Hy het vir my 'n paar vrae gevra om meer inligting oor verslytbare en nie-verslytbare produksiebates. Ek gaan probeer om nou die eerste vraag te beantwoord.

Dit is vir ons duidelik dat alle produksie-bates nie dieselfde lewensduur het nie, m.a.w. ons kry bates wat 'n kort termyn het, dié wat daagliks afgeskryf word deur gebruik soos gebruiksgoedere. Dan kry ons produksiebates op 'n mediumtermyn en 'n langtermyn, as ons kyk na die mediumtermyn dan vind ons dit is hoofsaaklik items soos motorkarre, vragmotors, swaartoerusting, kantoormeubels, lostoerusting en sekere gereedskap en dat die afskryfperiode daarvan wissel tussen 4 en 13 jaar in die geval van Evkom. Kyk ons na die langtermyn toerusting soos opwekkingstoerusting, transmissiewerke, dan vind ons dat die afsluitingsperiode enige iets is van 25 tot 30 jaar. Hy het gevra wat is die besondere eienskappe van slytende, duursame produksiebates.

Een van die besondere eienskappe is dat ten spyte van die feit dat dit vir ons vir baie, baie jare diensbaar kan wees, dit in hierdie tye van snel-tegnologiese ontwikkeling probleme skep wat die beskikbaarheid van onderdele betref en daar gevind word dat in baie sulke gevalle daar 'n proses van die voorsiening, aankoop van strategiese onderdele weer eens op 'n geordende basis plaasvind.

Hy het ook die vraag gevra van die kapasiteit van duursame produksiebates. Ek kan u net vinnig sê, dat ek dink mens kan aanvaar dat hierdie kapasiteit se vermoë stadig dog langsamerhand afneem en as ons dink aan die tegniese en ekonomiese lewensduur van produksiebates, dan het ons weer hier 'n probleem dat die finansiële en ekonomiese aspekte van die land hierop 'n invloed het. Dit is iets wat beïnvloed word en sterk beïnvloed word deur jou groeikoers, met ander woorde jou las-aanwas, en daar word gevind — hoe sneller die ekonomiese aanwas is, hoe gouer kan sodanige langdurige of duursame produksiebates om ekonomiese redes oorweging geniet om nie meer gebruik te word nie.

Ons vind wel, waar dit nie die geval is nie, dat dit tegnies in staat is om vir 'n baie lank periode nuttige diens vir die organisasie verrig.

Dan praat hy ook van die verloop van die waarde van prestasies van duursame produksiebates. Ek dink as ons kyk na die prestasie dan vind 'n mens dat jy by duursame produksiebates kom. Hier is twee kategorieë wat die elektrisiteitsbedryf betref, die elektrisiteitsvoorsieningsbedryf, as ons dink aan opwekkingstoerusting, dan vind ons dat ons met ons gevorderde of vorderende tegnologie groter installasies daarstel wat ons in die beginperiode redelike probleme gee wat beskikbaarheid betref, maar dat ons later optimale beskikbaarheid het, en dat ons later in die lewensduur van die duursame bate vind dat as gevolg van die ontwikkeling van die tegnologie weer in daardie tydvak, hierdie vroeëre duursame produksiebates, wat 'n goeie prestasie gehad het, hoewel dit nog goed kan presteer, as gevolg van die ekonomiteit, ontwikkeling van die tegnologie, na die laer meriete lys verskuif en dat ander nuwer toerusting verkieslik om ekonomiese redes in die plek daarvan gebruik word.

Mr. President, Mr. Adams shot a few questions at me and I will try to answer those which I can remember.

He highlighted the fact that on account of all the cost increases, it is necessary to do proper maintenance on equipment. He also mentioned the fact that it is not only the large items, but also the small items that require attention.

Meneer die President, hier wil ek net aanhaal, ons moet baie versigtig wees, want hulle sê altyd dit is die klein jakkalsies wat die wingerde verniel en ek kan nie oorbeklemtoon dat alhoewel dit miskien nie so 'n geweldige koste blyk te wees nie, as mens daaraan dink dat enige organisasie vandag tot 'n groot mate afhanklik is van vervoer, mobiele toerusting om sy werk te kan doen. Enige organisasie soos ons, soos die organisasies wat u verteenwoordig, laat ons besef dat daar vir baie mense die moontlikheid gestel word, of die moontlikheid geskep word om onoordeelkundig van mobiele toerusting soos vervoer, gebruik te maak en dit is iets wat enige organisasie vandag nie kan bekostig nie, en waar daar baie gedoen moet word, tewens ook alreeds gedoen word om daardie klas van gebruik van toerusting te optimiseer.

It is quite correct that we are making use of our production asset register to obtain values for which we are negotiating for premiums for insurance. We also hope to develop the production assets register further so that, as I have pointed out in my paper, we can eventually get a complete history and cost record production asset throughout its entire life span.

Daar is gevra oor die feit dat produksiebates-departement, die organisasiekaart wat ek gewys het, in Megawatt Park gesetel is, dit is heeltemal korrek, daar is ook ooreenkomstige produksiebates-funksies in die streke, en waar ek in my referaat daarop gewys het dat Evkom die prinsipe van lyn en stafverhoudings gebruik, moet ek beklemtoon dat die Produksiebate Bestuurder verantwoordelik is vir al die verkryging van aankope wat Evkom betref, kontraktueel gesproke, en dat daardie funksies via die Streeksbestuurder laer gedelegeer word, maar delegasie beteken nie abdikasie nie, en daar bestaan die nodige moniteringsprosedures waarby die vereiste funksionele beheer oor sodanige prosesse gehou word.

Mr. Adams' last question deals with quality control. Quality control in this country is something fairly new. I think this is because we have mostly been a purchasing country. We are only now becoming a manufacturing country, and where we in the past, were sure when we bought equipment from overseas that it was normally of a good quality because of the controls exercised by the manufacturers, we now find that with progress in local manufacture quality assurance is becoming increasingly important. It is very necessary that good quality assurance techniques and procedures are maintained to ensure the quality of the end product.

In Escom it is at present being controlled by a quality Assurance Manager, who is directly responsible to the General Manager Executive's office, and he has functional control over all quality assurance matters throughout Escom.

Dankie Meneer die President.

MNR. P. J. BOTES, President:

Dit was vir my 'n besondere eer dat mnr. Lodewyk Rothman hierdie referaat kon lewer, veral gesien in die lig van sy pligte as Senior Bestuurder (Nuwe Werke), 'n baie veeleisende pos. Ons waardeer die feit dat u nog die tyd kon bestee om hierdie referaat te lewer.

As blyk van waardering oorhandig ons met genoeë aan u 'n das met die wapen van die Vereniging daarop.

Dames en here dit was 'n onderwerp wat vir die eerste keer bespreek is en wat in die toekoms van meer en meer belang sal word. Ek vra u dus om ons dank aan al die sprekers op die gewone wyse te betuig.

MNR. P. J. BOTES, President:

I have to inform you that Dr. Malcolm Hind has left the service of Crompton Electricars and his paper will consequently be delivered by Mr. P. J. W. Robinson, General Sales Manager (Road Vehicles) of Messrs. Crompton Electricars Ltd. Mr. Robinson was born in Tynemouth, England and started his career as a clerk with the Bank of England. He joined Smiths Electric Vehicles (electric vehicle manufacturers) in 1960 as Assistant Sales Manager.

In 1966 he joined Oxford Electrics, who specialised in electric vehicle service/repairs, first in the capacity of Assistant Manager and later as Managing Director. In 1976 he joined Crompton Electricars Ltd., as Regional Manager and has recently been promoted to the position of General Sales Manager.

MR. P. J. W. ROBINSON, General Manager, Crompton Electricars Ltd.,

Mr. Chairman — I know that Dr. Hind was looking forward very much to coming here and presenting his own paper. Unfortunately circumstances have made this impossible, but this leaves me with the privilege and pleasure of visiting your Country for the first time, and addressing your Conference.

I hope that you will consider me an acceptable substitute.

'N WYER MARK VIR KONVENSIONELE ELEKTRIESE PADVOERTUIE?

'n Groeiende bewustheid van die noodsaaklikheid daarvan om ons besoedelde omgewing te beskerm en die toenemende bedreiging van 'n tekort aan olievoorrade wat ons voor die deur staan, het albei daartoe bygedra om die huidige hoë vlak van belangstelling in die moontlike gebruik van elektriese voertuie wat deur batterye aangedryf word, te stimuleer, maar, alhoewel die gebruik van sulke voertuie vir sommige mense na 'n nuwe oplossing vir hedendaagse probleme mag lyk, moet daar nie aanvaar word dat daar enigiets nuuts is omtrent elektriese voertuie as sodanig nie.

Oor die algemeen word daar nie besef dat die eerste elektriese voertuie om en by 1880 verskyn het nie en voor die eeuwisseling, het 'n elektriese motor wat liefderik 'La Jamais Contente" genoem is, in 1899 verskyn. Dit het die wêreldlandspoedrekord van 65.79 m.p.u. gehou.

Teen 1890 is verskeie passasiersvoertuie ontwikkel en hulle was in Londen en Parys in gebruik. In Noord-Frankryk was 'n batteryaangedrewe lokomotief gedurende die oorlogsjare 1914—1918 in gebruik. Kort na hierdie oorlog, is battery-elektriese voertuie vir afvalversameling in die meeste groot stede in die VK ontwikkel — dit het berus op die beginsel dat afval wat deur die elektriese voertuie versamel word, verbrand word om elektrisiteit te ontwikkel, 'n gedeelte waarvan gebruik is om die elektriese voertuig se battery te herlaai — 'n geslote, selfonderhoudende baan, 'n beginsel wat vandag weer oorweeg kan word.

Terwyl batterykrag gedurende die vroeë dae van voertuigproduksie effektief met petrolkrag meegeding het, het die petrolenjin uiteindelik met 'n bietjie hulp van Henry Ford en William Morris, die mark oorheers.

Tans dui die mees betroubare raming daarop dat daar ongeveer 25 000—30 000 voertuie wat met elektrisiteit aangedryf word in die VK is, en dat hierdie syfer oor die afgelope paar jaar betreklik konstant gebly het. Die meeste van hierdie voertuie word deur die suiwelnywerheid ge-

A WIDER MARKET FOR CONVENTIONAL ELECTRIC ROAD VEHICLES?

The growing awareness of the necessity to protect our polluted environment, and the increasing threat of an impending shortage of oil supplies, have both served to stimulate the current high level of interest in the possible use of battery operated electric vehicles but, although, the use of such vehicles may have come to some people as a new solution to present day problems, it must not be assumed that there is anything new about electric vehicles themselves.

It is not generally appreciated that the first electric vehicles appeared around 1880 and before the turn of the century in 1899 an electric car, named affectionately "La Jamais Contente", held the world land speed record at 65.79 m.p.h.

By 1890 several passanger vehicles had been developed and were in use in London and Paris, and a battery locomotive operated in Northern France during the war years of 1914—18. Shortly after the war, battery electric refuse collection vehicles were developed for use in most of the major cities of the UK — the principle being that the refuse collected by the electrics was burned to produce electricity, part of which was used for charging the batteries of the electrics — a closed, self-supporting circle, the principle of which might well be considered today.

Whilst battery power effectively competed with petrol power in the early days of vehicle production, the petrol engine finally dominated the market with some assistance from Henry Ford and William Morris.

The most reliable estimate at present suggests that there are approximately 25 000—30 000 electrically propelled road vehicles in the UK, this number having remained reasonably constant over the last few years. The majority of these vehicles are used for the delivery of milk

bruik vir die aflewering van melk en verwante produkte, met 'n klein aantal elektries-aangedrewe vragwaens in gebruik deur wasserye, bakkerye, hospitale, ens.

In vergelyking is daar ongeveer 15 miljoen passasiersvoertuie op die VK se paaie en 1,8 miljoen handelsvoertuie. Die huidige aantal elektriese voertuie verteenwoordig minder as 2% van die totale aantal handelsvoertuie in gebruik, wat dui op baie lae indringing in die VK se padvervoernetwerk.

Die jaarlikse aanvraag na vervangende elektriese padvoertuie wissel tussen 1 000 en 2 000 eenhede per jaar. Hierdie relatief lae syfers word in 'n mate beïnvloed deur die lang lewensduurte van hierdie voertuie. In teenstelling is die jaarlikse mark vir passasiersvoertuie in die VK ongeveer 1,2 miljoen, en dié vir handelsvoertuie ongeveer 220 000.

In Europa en die VSA is die gebruik van elektriese padvoertuie onbeduidend. Die VK is uniek daarin dat dit oor 'n relatief groot vloot elektriese voertuie beskik, wat in die suiwelbedryf in daaglikse gebruik is, hoofsaaklik te danke aan die volgehoue aanvraag na drumpelaflewering van melk.

VOERTUIGPRESTASIE

Op die oomblik kan elektriese voertuie nie ten opsigte van spoed, of die afstand van die reis wat afgelê kan word voor die battery herlaai moet word, met binnebrandenjins meeding nie. Hierna word verwys as die voertuigafstand. Tipiese topspoed vir voertuie is tot 40 m.p.u. (65 km/h) en die bruikbare afstand tot 40 myl (65 km). Hierdie beperkings laat die toepassing van elektriese voertuie krimp tot kortafstandvervoer waar slegs 'n matige snelheid verlang word. Daar bestaan egter 'n groot aantal toepassings waar hierdie beperkings nie betekenisvol is nie, maar dit moet altyd in gedagte gehou word dat die afstandbeperking nie maklik oorkom kan word nie, en elektriese voertuie in die algemeen nie vir die private motoris wat beweeglikheid verlang, en nie sy daaglikse vervoervereistes volgens die bogenoemde beperkings wil beplan nie, aantreklik is nie. Vlootoperateurs kan egter dikwels hulle vervoerbedrywighede instel om die klaarblyklike beperkings in voertuigprestasie te oorkom, en dit het 'n gebruikspatroon daargestel waar elektriese voertuie gewoonweg in vlote gebruik kan word om ware te vervoer. Ten spyte van die afstandbeperking bestaan daar tans 'n baie groot aantal voertuigtoepassings waar die elektriese voertuig toereikend aan vereistes kan voldoen, indien die werklike vereistes ontleed word.

Voertuigprestasie is in 'n groot mate afhanklik van die hoeveelheid energie wat in die battery opgebou word: die battery het dus 'n wesentlike invloed op die aanvaarbaarheid van die elektriese voertuig.

BATTERYE

Dit is moeilik om groot hoeveelhede elektriese energie te akkumuleer sonder wesenlike gewig- en kostenadele, en tans gebruik elektriese voertuie amper sonder uitsondering loodsuurtrekkragbatterye vir hierdie doel. Chemies kom hierdie battery ooreen met die bekende motorbattery wat vir beligting, aanskakeling en ontsteking gebruik word, maar hulle word gebou vir 'n verwagte lewensduur van omtrent 5 jaar onder volle laai-ontlaaisiklustoestande.

Die belangrikste eienskap van die loodsuurbattery is die betreklik lae hoeveelheid energie wat per eenheidmassa geakkumuleer kan word, en dit is tipies 25 watt-uur vir elke kg batterymassa. Daarenteen bevat petrol wat by die gewone pomp verkry word ongeveer 13 kW-uur se energie per kg petrol, wat 'n energievoordeel van 500:1 gee in vergelyking met hedendaagse batterye. terwyl dit nie prakties is om die energie wat in petrol geberg is so doeltreffend te benut as die elektriese energie wat in die battery geakkumuleer is nie, is dit duidelik dat die energiedigtheid van hierdie twee bergingsmedia grootliks verskil, en dit was in 'n groot mate verantwoordelik vir die huidige hoë aanvraag na padvervoerbrandstof met 'n petroleumbasis.

Met die verloop van tyd het die energiedigtheid van loodsuurbatterye geleidelik verbeter en daar is aanduidings dat verdere verbeterings binne die volgende paar jaar moontlik mag wees, aangesien die absolute elektro-chemiese grens vir die loodsuurbattery 167 watt-uur per kg batterymassa is, alhoewel die maksimum prakties bereikbare grens, met inagneming van die onvolledige benutting van aktiewe materiaal, die noodsaaklikheid daarvan om die suur te verdun, verskaffing van paslike houers, elektriese aansluitings, ens. ongeveer 40—65 W-uur per kg is.

Die massa van 'n battery in 'n voertuig wat met 'n battery aangedryf word, is dus 'n probleem, en tipiese voertuigontwerp moet tussen 25 en 35% van die totale voertuigmassa toelaat net vir die battery, voordat goedere en die bestuurder geakkommodeer kan word.

Benewens die massa-probleem is hedendaagse batterye ook relatief groot, en genoegsame ruimte moet binne die voertuig voorsien word om hulle te akkommodeer. Sommige van hierdie eksperimentele batterye wat die belofte van hoë energiedigtheid inhou sal nog aan volumebeperkings moet voldoen, en dit mag steeds 'n probleem vir voertuigontwerpers bied.

and associated products by the Dairy industry, with a small number of electrically propelled vans in use by launderies, bakeries and hospitals, etc.

In comparison, there are approximately 15 million passenger cars on the roads of the UK and 1,8 million commercial vehicles. The present electric vehicle population represents less than 2% of the total commercial vehicles in use, indicating a very low penetration into the UK road transport system.

The annual demand for replacement electric road vehicles fluctuates between 1 and 2 thousand units per annum, these relatively low figures being to some extent affected by the long life of these vehicles. In contrast, the annual market for passenger cars in the UK is roughly 1,2 million, and that for commercial vehicles approximately 220 000.

In Europe and the USA there is an almost negligible useage of electric road vehicles, the UK being unique in having a relatively large fleet of electric road vehicles in every day use in the Dairy industry, due mainly to the continuing demand for doorstep delivery of milk.

VEHICLE PERFORMANCE

Electric vehicles are currently unable to compete with internal combustion engined vehicles in speed or length of journey that can be undertaken before re-charging is required, this being referred to as vehicle range. Typical vehicle top speeds are up to 40 m.p.h. and useable range up to 40 miles. These limitations restrict the application of electric vehicles to short haul duties where only moderate top speeds are required. There are however a very large number of applications when these limitations are not significant, but it must be appreciated that the limitation of range can not easily be overcome, and generally electric vehicles are not attractive to the private motorist who requires flexibility, and does not wish to pre-plan his daily transport requirements to fit in with the above limitations. Fleet operators can however often manage their transport operations to accommodate the obvious restrictions in vehicle performance, and this has established a pattern of useage where electric vehicles are normally used in fleets for carrying goods. At present, despite the limitations of range, there exists a very large number of vehicle applications where the electric can adequately meet the needs, once the actual demands have been analysed.

Vehicle performance is dependent largely upon the quantity of energy stored within the battery: the battery does therefore considerably affect the acceptability of the electric vehicle.

BATTERIES

It is difficult to store large quantities of electrical energy without considerable weight and cost penalties, and almost invariably present day electrics utilise lead acid traction batteries for this purpose. These batteries are chemically similar to the familiar car battery used for lighting, starting and ignition, but are built to have an expected life of about 5 years under full cycle charge — discharge conditions.

The main characteristic of the lead acid battery is the relatively small amount of electrical energy that can be stored per unit weight, and this is typically 25 W.h. for every kg of battery. In comparison, petrol dispensed at the forecourt pump contains approximately 13 kW.h of energy per kg of petrol, giving an approximate energy advantage of 500:1 compared to present day batteries. Whilst it is not practical to utilise the energy stored in petrol as efficiently as the electrical energy stored in the battery, it is obvious that the energy density of these 2 storeage media are very dissimilar indeed, and this has to a large extent been responsible for the present high demand for petroleum based fuels for road transport.

Over the years, the energy density of lead acid batteries has improved gradually and there are indications that further improvements are possible within the next few years, since the absolute electro-chemical limit for the lead acid battery is 167 W.h per kg of battery, although the maximum practical achievable limit, taking into account the incomplete utilisation of active material, the necessity to dilute the acid, provision of suitable containment, electrical connections etc. is between 40—65 W.h per kg .

The weight of the battery on an electrically propelled road vehicle thus constitutes a problem, and typical vehicle designs must allow between 25—35% of th total vehicle weight for the battery alone, before goods and the driver can be accommodated.

Apart from the problem of weight, present day batteries are also relatively large, and adequate space has to be provided within the vehicle to accommodate them. Some of the new experimental batteries offering the promise of high energy densities will still have to meet volume restrictions, and this may well be a continuing problem for vehicle designers.

Om 'n bruikbare spanningsvlak in 'n voertuig te bereik, moet 'n groot aantal selle in serie verbind word, en dit lei dikwels tot die noodsaaklikheid om tussen 20 en 50 selle met tussenposes van ongeveer twee weke by te vul — dit kan tydrowend wees en vereis die verskaffing van toeganghokke ens., binne die voertuig.

Hedendaagse batterye is relatief duur, en alhoewel hulle koste-effektief is oor hulle totale lewensduur, kan die aanvangskoste 'n struikelblok wees vir eienaars wat hulle vir die eerste keer aanskaf en wat wel een of ander vorm van huur- of bruikhuurooreenkoms bo aankoop sal verkies.

Sodra die batteryenergie uitgeput is moet die battery elektries van die hoof kragnet herlaai word. Dit neem sewe tot twaalf uur en mag die bevaar nie, maar ook deur die geïnstalleerde hoof kragnet se vermoë om die vereiste lewering te verskaf. 'n Vergelyking met petrol toon hier weer die probleem duidelik aan, aangesien 'n moderne voorpleinpomp, op 'n energieleweringsgrondslag energie teen die koers van ongeveer 15 MW lewer. Hierdie is ongetwyfeld 'n probleem vir die voorsieningsowerhede indien batterytegnologie tot 'n vlak ontwikkel waar so 'n herlaaikoers moontlik is.

Ten spyte van die bogenoemde probleme met betrekking tot die loodsuurbattery, is dit tog die kragbron wat koste-effektiwiteit, betroubaarheid en 'n lang lewensduur bied en wat tans die meeste gebruik word vir elektriese padvoertuie.

Oor die algemeen is die voertuigbattery die enigste energie-akkumulator op die voertuig, en dit is dus nodig om hierdie energie so doeltreffend moontlik te benut vir die aandrywing van die voertuigpadwiele. Die voertuig se kragtoevoerdoeltreffendheid is dus van die uiterste belang in die voertuigontwerp.

SPOEDBEHEER

Om voertuigspoedbeheer te verkry word een of ander beheertoestel gewoonlik tussen die battery en die motor ingesit. In die verlede was dit 'n algemene gebruik om 'n eenvoudige roosterweerstand te gebruik wat deur kortsluitings spoedbeheer in stadiums kan bewerkstellig. Hierdie stelsel is egter ondoeltreffend, verskaf swak spoedbeheer en het ietwat rukkerige versnelling wat nadelig is vir die voertuig se transmissie, tot gevolg. Die stelsel se koste is egter relatief laag en dus maklik om in stand te hou, en tot onlangs was hierdie voordele voldoende om hierdie tipe beheer te behou.

Baie ander benaderings is gebruik om doeltreffendheid te verhoog en spoedbeheer te verbeter, onder andere, koolstapelbeheerders, reostate en batteryskakelstelsels waar die battery verdeel word in twee of meer banke wat opeenvolgend oor die motor geskakel word. Die belangrikste mededinger vir roosterweerstand vandag is egter elektroniese beheerders wat hoë doeltreffendheid en gladde spoedbeheer verskaf ten koste van gekompliseerdheid en hoë kostes. Hoewel laespoedvoertuie nie noukeurige spoedbeheer nodig het nie, is hoërspoed elektriese padvoertuie en nywerheidvragmotors byna altyd met elektroniese beheer toegerus in die belang van spoedbeheer en doeltreffendheid.

Elektroniese beheerders werk deur die batteryspanning in kort polse te skakel of te onderbreek teen 'n frekwensie wat hoog genoeg is sodat die aandryfmotor die pulsreeks doeltreffend gelykmatig kan maak en net op die gemiddelde spanning reageer. Die motorspoed kan dus verander word deur die merkruimteverhouding of dienssiklus van die polsreeks te verander.

Hierdie beheerders, of onderbrekers, werk teen frekwensies van tot 1 kHz, top-strome van tot 1 000 amp, en gebruik byna altyd kragkommuteertiristors vir dié veeleisende taak, alhoewel transistors meer en meer by die laerkragpunt van die reeks gebruik word.

Alhoewel die koste van elektroniese beheer relatief hoog is, is dit moontlik om talle nuttige geriewe te inkorporeer, soos stroomperk, elektriese remming, beheerde versnelling, oorspoeduitskakeling, ens., teen 'n relatief lae bykomende koste.

Elektroniese beheerders kan ook aangebied word met bykomende energiebesparende kenmerke "ingeprogrammeer", insluitende regeneratiewe remming waar 'n gedeelte van die energie wat andersins in die voertuigremme vermors sou word tydens spoedvermindering by die battery teruggevoer kan word.

AANDRYFMOTOR

Die seriewikkelde gs-motor oorweeg op elektriese padvoertuie alhoewel vir spesiale aanwendings, en teen hoër spoed word die saamstelgewikkelde motor algemener.

Die motor is gewoonlik geleë onder die onderstelraam op die middellyn van die voertuig en dryf agteruit aan deur 'n konvensionele buigsaamgevoegde skroefas na 'n ewenaaras en daardeur na die agterwiele. Af en toe word ratkaste tussen die motor en agteras geplaas: indien by-

In order to promote a useable voltage level on the vehicle, a large number of cells have to be connected in series, and this often results in the necessity to top up between 20 and 50 cells at approximately two week intervals, which can be time consuming and requires the provision of access traps etc. within the vehicle.

Present batteries are relatively expensive and whilst being cost effective over their total lifespan, the initial cost, however, can be a stumbling block to first time owners, who may well prefer some form of lease or rental agreement to outright purchase.

When the battery energy is exhausted, the battery must be re-charged electrically from the main supply, taking between 7 and 12 hours, which may limit the availability of the vehicle unless spare battery sets are available, or 24 hour useage is not required. The re-charge time tends to be limited not only by the battery's ability to accept charge, but also by the capacity of the installed main supply to provide the necessary output. Again a comparison with petrol adequately demonstrates the problem here, since on an energy input basis, a modern forecourt pump delivers energy at the rate of approximately 15 MW. There is clearly a problem for the supply authorities if battery technology develops to the point where this rate of re-charge is possible!

Despite the previously mentioned problems associated with the lead acid battery it is the most widely used power source on present electric road vehicles, offering cost effectiveness, reliability and long life.

The vehicle battery is generally the only energy store on the vehicle, and it is therefore necessary to utilize this energy as efficiently as possible to drive the vehicle road wheels. Vehicle driveline efficiency is thus of paramount importance in the vehicle design.

SPEED CONTROL

In order to obtain speed control of the vehicle, some form of electrical control device is normally inserted between the battery and motor. In the past it has been common practice to utilise a simple grid resistance which can be shorted out in stages to effect speed control. This system is however inefficient, gives a poor speed control and results in a somewhat jerky acceleration detrimental to the vehicle's transmission. The system is however relatively low cost and simple to maintain, and until recently these advantages have been sufficient to retain this form of control.

Many other approaches have been made to increase efficiency or improve speed control, amongst these being carbon pile controllers, theostats and battery switching systems where the battery is divided into two or more banks, switched sequentially across the motor. The predominant competitor to grid resistance control today is however the electronic controller, which provides good efficiency and smooth speed control at the expense of complication and high cost. Whilst low speed road vehicles do not require precise speed control, higher speed electric road vehicles and industrial trucks are almost invariably equipped with electronic control in the interest of speed control and efficiency.

Electronic controllers are operated by switching, or "chopping" the battery voltage into short pulses at a frequency sufficiently high that the drive motor effectively smoothes out the pulse train. The motor speed may thus be varied by changing the mark-space ratio or duty cycle of the pulse train.

Present controllers, or choppers, operate at frequencies up to 1 kHz, with peak currents up to 1 000 amps and almost invariably utilise force commutated thyristors for this arduous duty, although transistors are beginning to appear at the low power end of the range.

Although the cost of electronic control is relatively high, it is possible to incorporate many useful facilities such as current limit, electric braking, controlled acceleration, overspeed cutout, etc., at relatively little additional expense.

Electronic controllers can also be offered with additional energy conserving characteristics "programmed" in, including regenerative braking where a proportion of the energy otherwise dissipated in the vehicle brakes during deceleration can be returned to the battery.

DRIVE MOTOR

The series wound D.C. motor predominates on electric road vehicles although for special applications, and at higher speeds the compound wound motor is becoming more common. Construction of both types of motor follows conventional practice, with some form of protected ventilation to avoid ingress of road dirt. The motor is normally located below the chassis frame on the centre line of the vehicle, driving rearwards through a conventional flexibly jointed propellor shaft to a differential axle, and thence to the rear wheels. Only rarely are gear

komende ratvermindering nodig is word dit gewoonlik in die ashulsel gehuisves. Die gs-motor het minimale instandhouding nodig (die laers is gewoonlik lewenslank verseël) en hou dikwels langer as die voertuig. Die twee gevare vir motorleeftyd is te hoë las en te hoë spoed: soms kom hierdie twee gevare saam omdat 'n lang steil opdraende dikwels deur 'n steil afdraende gevolg word. Onder hierdie omstandighede kan 'n warm motor sy soldeersel smelt of onder kommutatordistorsie lei.

Daar is natuurlik talle alternatiewe vir die stelsel beskryf, soos hand- of wisselverhoudingratkaste, wringkragomskakelaars, glykoppelings en selfs ws-motors aangedryf deur wisselrigters, maar tot dusver is baie min van hierdie alternatiewe op produksievoertuie aangepas.

ONDERSTEL

Die stuur en vering van motors volg konvensionele outomotiewe praktyk, dikwels met gebruik van gewone voertuigonderdele wat in die handel verkrygbaar is. In die belang van energie-ekonomie word straallaagbande verkies bo kruislaagbande omdat die weerstand van straallaagbande aansienlik minder is.

Omdat die batterylas so groot is het byna alle elektriese voertuie tans 'n swaar onderstelraam met voertuigbakpanele vas aan uitlopers van die raam. Hierdie soort konstruksie is tipies van swaar handelsvoertuie en hoewel dit duur is, gee dit groot buigbaarheid vir bakstyl en 'n lang voertuiglewe. Elektriese voertuie se onderstelle word dikwels minstens een keer gedurende hul lang lewe van nuwe bakwerk voorsien.

HULPVOORRAAD

Elektriese hulpvoorraad teen 12 of 24 volt kan verkry word van aftakkings op die hoofbattery, of soms van afsonderlike batterye wat deur 'n alterna-tor of wisselrigter gelaai word waar swaar hulplaste betrokke is. Hoewel dit onprakties is om die voertuigkajuit vanaf die battery te verhit (indien verhitting nodig is word verwarmers aangedryf deur elektriese akkumulators, propaan of gasolieverwarmers word geïnstalleer), kan hulplaste taamlik hoog word indien remdienspompe, skermontwasemers, agterligte, ens., geïnstalleer word.

LAAI

Herlaai van die voertuigbattery word gewoonlik gedoen buite spitstye vir ekonomiese toestande, met 'n afsonderlike muur- of vloergemonteerde laaier.

Moderne laaiers kan die laai-ingang beheer in ooreenstemming met die battery se vereistes en ophou werk sodra die battery volgelaai is. Dit word dikwels gevolg deur 'n outomatiese gelykstelfase waar die battery steeds gelaai word deur 'n baie lae vlak wat nie net die battery volgelaai hou nie maar ook die laaitoestand van elke sel gelykstel omdat sommige selle meer ontlaai as ander tydens 'n tydperk van gebruik.

Relatief min voertuie is met ingeboude laaiers toegerus, hoofsaaklik as gevolg van massaprobleme en die strewe na volledige isolering van die kragnettoevoer in die belang van veiligheid.

AANWENDINGS

Die meeste elektriese padvoertuie wat tans in die VK gebruik word is spesifiek vir melkaflewering ontwerp. Hierdie voertuie het 'n topspoed van tussen 10—25 m.p.u. (15—40 km/u) en bruikbare ryafstande van tot 40 myl (65 km). Let daarop dat die gebruiksafstand baie stop/rytoestande insluit, gewoonlik 300, wat nodig is vir huis-tot-huis-afleweringswerk. Die voertuie se winslas wissel tussen 1 000 en 2 000 kg . Byna al hierdie voertuie word elke dag van die jaar gebruik en hou dikwels 15 jaar of meer.

'n Vloot elektriese wasgoedafleweringsvoertuie word ook gebruik, hoofsaaklik in die Londense gebied. Hierdie voertuie het 'n topspoed van ongeveer 14 m.p.u. (22 km/u) en word daagliks vir ongeveer 20 myl (30 km) gebruik. Fisies kan die voertuie byna nie van petrol- of dieselvoertuie onderskei word nie en hulle word gebruik vir die aflewering van linneware, ens., aan fabrieke en kantoorgeboue in die groter stede. Hospitale gebruik ook elektriese voertuie vir 'n verskeidenheid take in en om die hospitaalterrein, omdat die voertuie skoon en stil is. 'n Gevallestudie van gebruik deur 'n wassery is afsonderlik beskikbaar.

Alle voertuie is nie doelontwerp nie en veranderings word dikwels gedoen aan standaard petrol- of dieselvoertuie omdat dit 'n relatief goedkoop manier is om prototipevoertuie in 'n kort tydsbestek te vervaardig. Tans het Chloride 'n aantal Commer Karrier-omskakelings onder beoordeling deur die Nasionale Vervoerkorporasie. Hierdie voertuie het 'n winsvrag van tot 1 750 kg, werk met 'n 160-volt-loodsuurbattery en het regeneratiewe beheer vir beter benutting van batteryenergie.

Lucas het ook veranderings aangebring op bedford-handelsvragdraers wat 'n winsvrag van 1 000 kg gee tot 50 m.p.u. (80 km/u) en met bereikboxes interposed between the motor and the rear axle: if additional gear reduction is necessary, this is usually accommodated within the axle casing. The D.C. motor requires only minimal maintenance to brushgear (bearings are generally sealed for life) and often outlasts the vehicle. The two dangers to motor life are overloading and overspeeding: sometimes these two abuses come together as a long crawl uphill is often followed by a fast run down again: under these conditions a hot motor can well throw solder or suffer commutator distortion. There are of course numerous alternatives to the system described, such as manual or variable ratio gear boxes, torque convertors, slip couplings, and even A.C. motors driven by invertors, but so far very few of these alternatives have been adopted on production vehicles.

CHASSIS

Vehicle steering and suspension follows conventional automotive practise, often utilising proprietary commercial vehicle components. In the interests of energy economy, radial ply tyres are preferred to cross ply since the rolling resistance of radial tyres is considerably less.

Due to the heavy weight of the batteries carried, almost all present electric vehicles utilize a heavy chassis frame, vehicle body panels being attached to outriggers taken from the frame. This form of construction is typical of heavy commercial vehicles, and whilst being expensive, does allow great flexibility of body style, and gives long vehicle life. Electric vehicle chassis are often re-bounced at least once in their life.

AUXILIARY SUPPLIES

Auxiliary electrical supplies at 12 or 24 volts are taken from taps on the main battery or sometimes from separate batteries charged via an alternator or invertor where heavy auxiliary loads are involved. Whilst it is impractical to heat the vehicle cab from the battery (if heating is needed, electric storeage, propane, or gas-oil powered heaters are fitted), auxiliary loads can become quite high if brake servo pumps, screen demisters taillights, etc. are fitted.

CHARGING

Re-charging of the vehicle battery is usually carried out during off peak periods for economy, with a separate wall or floor mounted charger.

Modern chargers are capable of regulating the charge input in accordance with the battery's requirements, automatically terminating the operation when the battery is fully charged, often followed by an automatic equalize phase where the battery continues to be charged at a very low current level which not only maintains the battery at full charge, but also equalizes the charge state of every cell, since over a period of useage some cells gradually become more discharged than others.

Relatively few vehicles are equipped with on board chargers, due mainly to weight penalties and the desire to isolate the vehicle completely from the main supply in the interest of safety.

APPLICATIONS

The majority of electric road vehicles in use at present in the UK are designed specifically for milk delivery. These vehicles have top speeds of between 10—25 m.p.h. and useable ranges of up to 40 miles. It should be noted that the useable range is inclusive of a very large number of stop/starts, typically 300, which is necessary for door to door delivery work. Vehicle payloads vary between 1 000 and 2 000 kg . Almost all of these vehicles are in use every day of the year and often last 15 years or more.

A fleet of electric laundry delivery vehicles is also in operation mainly in the London area, these vehicles having a top speed of approximately 14 m.p.h. and daily range of about 20 miles. The vehicles are almost indistinguishable physically from petrol or diesel vehicles and are used for the delivery of linen etc. to factories and office buildings in the larger cities. Hospitals are also accustomed to using electric vehicles in a variety of ways in and around the hospital grounds, where the quietness and cleanliness of electrics is appreciated. A case study of a laundry application is available as a separate handout.

Not all electric vehicles have been purpose designed, and often conversions are carried out on standard petrol or diesel vehicles since this is a relatively inexpensive method of producing prototype vehicles in a short time period. Currently Chloride have a number of Commer Karrier conversions under evaluation by the National Freight Corporation: these vehicles have a payload up to 1 750 kg, operate on a 160 volt lead acid battery, and have regenerative control to obtain improved utilization of the battery energy.

afstande van tussen 40 en 50 myl (65 en 80 km). Die batterye verskaf 216 volt en ook hier is regeneratiewe beheer geïnstalleer. Die enigste elektriese motor wat in 'n produksievorm vervaardig word, is die Enfield 8 000-stadsmotor wat deur sommige elektrisiteitsrade gebruik word.

Lucas het 'n elektriese taxi ontwikkel vir stadsgebruik, met 'n topspoed van 60 m.p.u. (100 km/u) en 'n bruikbare ryafstand van 100 myl (160 km). Hierdie afstand word deels bereik deur 'n relatief swaar battery (40% van die totale voertuigmassa) en deels deur die gebruik van 'n hoogs doeltreffende transmissiestelsel.

Oor die laaste paar jaar is verskeie elektriese busprototipes gedemonstreer en tans het Chloride hul Silent Rider-elektriese bus geproduseer met 'n maksimum spoed van 40 m.p.u. (65 km/u) en 'n bruikbare ryafstand van 40 myl (65 km). Die bus het 50 sitplekke en is toegerus met regeneratiewe beheer.

Omtrent dieselfde tyd het Lucas 'n kleiner 34-sitplek-bus gedemonstreer, gebaseer op 'n wysiging van die Seddon Midi-diesel bus. Hierdie voertuig kan 45 m.p.u. (70 km/u) en 40 myl (65 km) haal. Die batterye verskaf 360 volt en die bus het regeneratiewe beheer. Talle ander eksperimentele elektriese motors, busse, vragwaens, motorfietse, ens. is oor die jare in die VK sowel as in ander lande gebou en 'n aansienlike aantal word nog gebruik.

Bykomend tot die gebruik van batteryaandrywing vir padvoertuie word die elektriese nywerheidsvragmotor wyd gebruik in die nywerheid vir die skoon en stil verwydering van goedere. Die vurkhyser is miskien die bekendste nywerheidsvragmotor, maar elektriese trekkers, platformvragwaens, hyskrane en lokomotiewe word ook heelwat oor die hele wêreld gebruik.

NAVORSINGSPROGRAMME

In die VK borg die Londense Voorstedelike Raad die verhoogde gebruik van elektriese voertuie deur subsidies aan operateurs wat elektriese voertuie in die Londense gebied wil koop, tot 'n totale bedrag van £400,000. Hierdie program was baie suksesvol en die aantal voertuie wat goedere vervoer in die Londense gebied word as gevolg daarvan steeds meer. Daar is ook aansienlike navorsingsprogramme deur sowel Lucas as Chloride en verskeie prototipe elektriese voertuie is as gevolg daarvan gedemonstreer.

Die grootste ontwikkelingsprogram vir elektriese motors word in die VSA geborg waar $160m beskikbaar gestel is onder die demonstrasiewet PL94—413. Hierdie wet dek 'n tydperk van 5 jaar vanaf September 1976 en is bedoel om navorsing na elektriese voertuie te help en om die gebruik dan hierdie voertuie deur middel van borgskappe te bevorder. Na verwagting sal tot 5 000 voertuie onder hierdie wet gedemonstreer word. Die VSA in besonder wil graag die gebruik van elektriese voertuie bevorder aangesien 96,5% van die basiese brandstof gebruik deur alle vervoer in die VSA op petroleum gebaseer is.

In Japan is 'n staatswet, wat 'n bedrag gelykstaande aan $15m toewys, in Maart 1971 goedgekeur met 'n soortgelyke strekking as die VS-wet en 'n aantal voertuie is reeds gedemonstreer met die beskikbare fondse.

BATTERYWONTWIKKELING

Die ontwikkeling van elektriese voertuie word natuurlik heelwat beïnvloed deur die vordering op die gebied van batterye. Daar bestaan 'n baie groot aantal elektrochemiese koppelings wat elektriese energie kan akkumuleer en ongeveer 30 hiervan lyk tot dusver belowend, alhoewel net 'n relatief klein aantal tans omvangryk ontwikkel word.

Ontwikkeling word blykbaar veral gekonsentreer op die verbetering van die loodsuurbattery en die ontwikkeling van die natriumswaelbattery. Hoewel die loodsuurbattery na verwagting tot ongeveer twee maal sy huidige energiedigtheid ontwikkel kan word, toon die natriumswaelbattery belofte van 'n energiedigtheid van ongeveer 5 maal dié van die huidige loodsuurbattery en ontwikkelingsprogramme word tans in die VSA en die VK gedoen. Alhoewel prototipeselle ontwerp en bevredigend gedemonstreer is, is daar nog baie werk om te doen op hierdie battery insluitende houerbeplanning en veilige werking vir 'n battery wat teen 'n temperatuur van 350°C werk — die normale werkstemperatuur van die natriumswaelbattery.

Die nikkelysterbattery het onlangs 'n bietjie aandag ontvang hoewel dit nie tans enige betekenisvolle verbetering in energiedigtheid bo die loodsuurbattery bied nie en relatief duur is. Nogtans is dit betroubaar en sterk. Die sinkchloorbattery beloof 'n energiedigtheid van 150 Wh/kg. Ontwikkeling word tans veral in die VSA gedoen alhoewel dit nie lyk of dit beter as die natriumswaelbattery sal wees nie.

Al bogenoemde batterye word as sekondêre batterye beskryf wat elektriese herlaaiing nodig het na ontlaaiing.

Die brandstofsel werk deur die oksidering van 'n brandstof soos waterstof of metanol om elektrisiteit op te wek en word herlaai deur eenvoudig brandstof by te voeg. Dit het 'n aantal jare gelede na 'n baie belo-

Lucas have similarly carried out conversions on Bedford C.F. Vans, providing a 1 000 kg payload at speeds of up to 50 m.p.h. and with achievable ranges of between 40 and 50 miles. The batteries provide a supply of 216 volts and again re-generative control is fitted. The only electric car manufactured in a production form is the Enfield 8 000 city car in use by some local Electricity Boards.

Lucas developed an electric taxi for use in cities, with a 60 m.p.h. top speed and a useable range of 100 miles, this range being achieved in part by a relatively high weight of battery (40% of the vehicle total weight) and part by the use of a high efficiency transmission system.

Over the last few years several electric bus prototypes have been demonstrated and at present Chloride have produced their "Silent Rider" electric bus with a maximum speed of 40 m.p.h. and a useable range of 40 miles. The bus has 50 seats and re-generative control is fitted.

At about the same time Lucas demonstrated a smaller 34 seater bus based on a conversion f the Seddon midi diesel bus. This vehicle has a top speed of 45 m.p.h. and a range of 40 miles. The batteries provide 360 volts and re-generative control is fitted. Many other experimental electric cars, buses, vans, motorcycles, etc. have been built over the years both in the UK and abroad, and a considerable number of them are still in service.

In addition to the use of battery propulsion for road vehicles, the electric industrial truck is used throughout industry for the quiet and clean transportation of goods. The forklift truck is probably the best known type of industrial truck, but electric tractors, platform trucks, cranes and locomotives are also in widespread useage throughout the world.

RESEARCH PROGRAMMES

In the UK the Greater London Council are sponsoring the increased use of electric vehicles by way of subsidies to operators wishing to purchase electric vehicles in the London Area, to a maximum of £400,000 in total. This programme has so far been very successful and the number of electric goods carrying vehicles in use in London is steadily increasing as a result. there are also substantial research programmes by both Lucas and Chloride and several prototype electric vehicles have been demonstrated as a result.

The largest electric vehicle development programme is being sponsored in the USA where $160m has been made available under the demonstration Act PL94—413. This Act covers a period of 5 years from September '76 and is intended to aid research into electric vehicles and to promote increased use of these vehicles by way of sponsorship. It is hoped that up to 5 000 electric vehicles will be demonstrated under this Bill. The USA in particular is anxious to increase the useage of electric vehicles, since at present 96,5% of the basic fuel used for all transportation in the US is petroleum based.

In Japan, a Government Bill allocating the equivalent of $15m was passed in March 1971 on similar lines to the US Bill and a number of electric vehicles have so far been demonstrated from the funds available.

BATTERY DEVELOPMENT

The development of electric vehicles is clearly much influenced by the progress achieved in the battery field. There exist a very large number of electro-chemical couples capable of storing electrical energy and approximately 30 such couples have been so far identified as having real promise, although only a relatively small number of these are being vigorously developed at present.

Development appears to be concentrated particularly on improving the lead acid battery, and developing the sodium sulphur battery. Whilst it is anticipated that the lead acid battery is only capable of development to approximately double its present energy density, the sodium sulphur battery holds promise of an energy density some 5 times that of the present lead acid battery and development programmes are presently under way in both the US and the UK. Although prototype cells have been constructed and satisfactorily demonstrated, there is still much work to be done on this battery including consideration of containment and safe operation for a battery which operates at a temperature of 360 degrees C, which is the normal running temperature of the sodium sulphur battery.

The Nickel-Iron battery has received some attention recently, although at present it does not offer any significant improvement in energy density over the lead acid battery and is relatively expensive, but has great reliability and robustness. The Zinc Chloride battery promises an energy density of 150 w hrs. per kg. Development is being undertaken primarily in the USA although it does not appear to be as advanced as the sodium sulphur battery.

All the above batteries are described as secondary batteries, requiring electrical re-charging at the end of the discharge.

The fuel cell operates by oxidising a fuel such as hydrogen or methanol

wende oplossing vir die elektriese voertuig gelyk, maar vroeë optimisme het vervaag en tans is die tegniese probleme so groot dat min werk gedoen word aan die brandstofsel as 'n moontlike kragbron vir die elektriese voertuig.

DIE TOEKOMS

Die ontwikkeling van elektriese voertuie geniet nou in talle lande aandag op regeringsvlak. Elektriese voertuie skei min of geen dampe af nie en werk besonder stil. Omvattende gebruik van dié voertuie in ons stede sal 'n dramatiese verbetering in die midde-stadomgewing veroorsaak en tans moet regerings die elektriese voertuig as 'n moontlike oplossing vir hierdie alomteenwoordige probleme beskou.

Die belangrikste aantreklikheid van die elektriese voertuig is egter sy onafhanklikheid van 'n petroleumbasisbrandstof. Hoewel die beskikbare hoeveelheid petroleumbrandstowwe tans voldoende lyk en Brittanje na verwagting selfvoorsienend sal wees in die tydperk 1980—1990, sal hierdie brandstowwe kort na die jaar 2000 na raming begin skaars raak.

Die toekoms moet dan tweedelig beskou word — oor die korttermyn en die langtermyn. Oor die korttermyn solank petroleumbasisbrandstowwe nog beskikbaar is, lyk dit seker dat brandstofekonomiemaatreëls toenemend 'n uitwerking op binnebrandenjinontwerp sal hê en die meeste motorvervaardigers bied reeds ekonomiese dieselenjins vir sommige modelle. in Amerika word groot klem gelê op brandstofekonomie in passasiersmotors en word die binnebrandenjin verder ontwikkel om ekonomie te verbeter. Laasgenoemde sal dan na verwagting sterk kompetisie vorm vir die elektriese voertuig oor die korttermyn en 'n relatief groot vermeerdering in die gebruik van elektriese voertuie word nie verwag tensy 'n dramatiese verbetering in batterytegnologie beskikbaar raak nie.

Na verwagting sal die gebruik van elektriese voertuie vir handelsdoeleindes soos vragwaens en busse eerste vermeerder terwyl die elektriese motor hierdie ontwikkelings sal volg.

Met toenemende skaarsheid van petroleumbrandstowwe, bied elektrisiteit egter 'n werklike oplossing vir die langtermynprobleem. Elektrisiteit kan verkry word uit steenkool, kernbrandstof en die son as getykrag, golfkrag, windkrag ens. met die moontlikheid dat versmeltreaktors gedurende hierdie tydperk lewensvatbaar sal word.

Dit is egter uiters moeilik om te probeer om die belangrikheid van die elektriese voertuig oor die langtermyn te voorspel omdat die moontlikheid dat sintetiese brandstowwe vervaardig kan word, die gebruik van waterstof geproduseer deur elektroliese, veranderde patrone in openbare en private vervoer, verbetering in oudiovisuele kommunikasie wat die vervoervereistes van individue beïnvloed, ens. in aanmerking geneem moet word. Met die vordering wat oor die afgelope 50 jaar op die gebied van vervoer plaasgevind het, het mens werklik 'n kristalbal nodig om selfs net te waag om ons vervoerstelsel vir die jaar 2000 te voorspel.

to produce electricity, and is re-charged simply by providing further supplies of fuel. This appeared to be a very promising solution for the electric vehicle some years ago, but early optimism appears to have faded and at present the technical problems are such that little work is taking place on the fuel cell as a possible power source for the electric vehicle.

THE FUTURE

Development of electric vehicles is now attracting attention at Government level in many countries. Electrics produce little or no fumes and are extremely quiet in operation. Widespread use of electrics in the city centre environment would bring about a dramatic improvement and at present governments must view the electric as a possible solution to these problems. The main attraction of the electric must however be its independence of petroleum based fuels. Whilst the supply of petroleum fuels appears adequate at present, and in fact the UK is expected to be self sufficient in the period 1980—1990, it is estimated that these fuels will become scarce shortly after the year 2000.

The future must then be viewed from two points of view — the short term and the long term. Within the short term petroleum based fuels are still available and it seems certain that fuel economy measures will increasingly effect internal combustion engine design, and already the majority of car manufacturers are offering economical diesel engines on sme models. In America great emphasis is currently being placed on fuel economy in passenger cars, and the internal combustion engine is being further developed to improve economy. The latter must then be expected to offer very strong competition to the electric over the short term, and only a relatively steady increase in the useage of electric vehicles is expected unless a dramatic improvement in battery technology becomes available.

It is anticipated that the useage of electric vehicles for commercial purposes such as vans and buses is most likely to increase at first, with the electric car following these developments. With increasing scarcity of petroleum fuels, the electric does however offer a real solution to the long term problem. Electricity can be provided from coal, nuclear and the sun, either as tidal power, wave power, wind power, etc. with some possibility of fusion reactors becoming viable over this period.

It is extremely difficult however to attempt to forecast the importance that the electric vehicle will achieve in the long run, since due consideration must be given to the possibility of manufacturing synthetic fuels, the use of hydrogen produced by electrolysis, changed patterns of public and private transport, improvements in audio-visual communications affecting the transportation needs of individuals etc. With the advances that have taken place in the field of transport in the last 50 years it would indeed require a crystal ball to even attempt to anticipate our transportation system for the year 2000!

BESPREKINGS/ DISCUSSIONS

J. D. N. VAN WYK, Director
NATIONAL ELECTRICAL ENGINEERING RESEARCH INSTITUTE
Council for Scientific and Industrial Research

I would like to add a few comments concerning some other programmes not mentioned by Dr Hind, specifically the work of the Gesellschaft für Elektrischen Strassenverkehr (GES) in West Germany, and then I would like to make some comments on the electric vehicle in South Africa.

Firstly, something about the battery systems referred to by Dr Hind. I agree that until the mid 1980's the lead-acid battery will probably be the only one commercially available for mass applications in electric vehicles. Even beyond that it will probably, in its final developed form, still play an important role. The reasons are that for the short range, low-speed urban application of electric vehicles, the range can be quite adequate (as can be seen in figure 1)[1]) and, in addition, that it is a system with a well established manufacturing and service infrastructure.

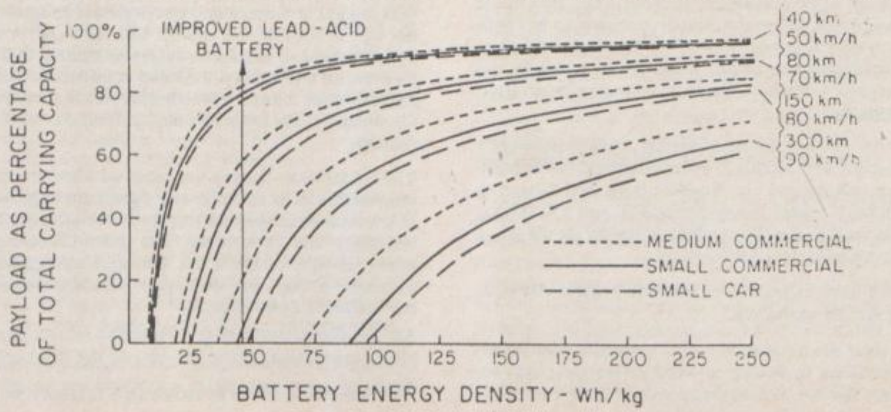


FIGURE 1

1. A review of the current status and future prospects of battery powered electric road vehicles by J. D. N. van Wyk, Transactions of the SA Institute of Electrical Engineers, Vol. 69, Part 2, February 1978.

Dr Hind did not mention the lithium-sulphur battery, which is very strongly supported in the USA and on which some development work is also going on in South Africa. It has the same improved energy density advantage as the sodium-sulphur couple, but also the same disadvantage of high temperature operation. As Dr Hind pointed out, the eventual limitation may be the time-energy balance — i.e. the ability to charge the battery in a reasonable time. It almost appears as if battery exchange systems will be mandatory to overcome this problem. Rental of batteries could also alleviate the problem of first cost of the battery and replacement during life.

I would like to make reference to the evaluation and promotion programme which is being carried out by the GES in West Germany. I think this programme is particularly relevant since it combines overall technical control control and the necessary stimulation and objective assessment by the GES with the co-ordinated participation of motor manufacturers, electrical manufacturers and battery manufacturers.

The GES presently has some 130 electric vehicles of 2 types, with payloads of 800 kilogram and 1 400 kilogram respectively, in operation with various fleet operators in West Germany. We at the CSIR have joined in this programme and we have been operating two vehicles as part of our transport fleet for the past two years. The vehicles, which are based on modified bodies of production internal combustion engine vehicles, have been extensively tested for performance and reliability and the programme is now aimed at obtaining operational statistics. In addition, the GES has carried out an extensive test with 20 battery electric buses on three regular routes, one in München-Gladbach and two in Dusseldorf. At present over 3 billion vehicle kilometres have been accumulated in a passenger carrying service. The average consumption of energy was between 1,39 and 1,65 kWh/km depending on the particular motor type used. Availability of service, after initial teething problems had been sorted out, is now approaching 80%.

The buses used on advanced interchangeable lead-acid battery pack on a trailer. Battery exchange is automatic and is carried out by the driver at one of the termini on the route. Exchange takes about 5 minutes.

In München-Gladbach the route is 40 km long with 94 stops. Although batteries were originally changed after two round trips, it is now done after each trip to reduce excessive discharge and improve battery life. In Stuttgart two lines are operated: one on a route of 10,5 km with 26 stops which is traversed 6 times before battery change and another on a route of 28,8 km with 60 stops which is traversed twice before battery change.

Looking at South Africa, investigations carried out by the Electric Vehicle Committee[2] indicated the following trip statistics for private car owners in city areas such as Johannesburg, Pretoria, Durban and Cape Town (Fig. 2):

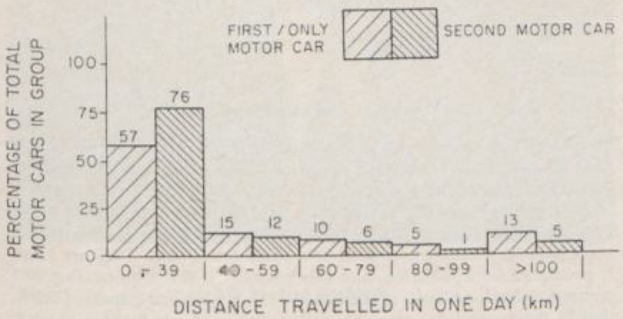


FIGURE 2

2) The expected influence of electric vehicles on the demand for petroleum in South Africa, CSIR Special report, Elek 142, Pretoria, May 1978, submitted to the Electric Vehicle Committee.

The survey indicated that for a second car the average daily distance travelled is 34,2 km as compared to 57,6 km for a first or only car. In addition, 76% of the daily trips of the second car were less than 40 km, 88% less than 60 km and 94% less than 80 km . For a first and only car the corresponding figures are 57%, 72% and 82% respectively. Another interesting fact was that a first or only car is used on the average 11 times per year for trips exceeding 100 km and a second vehicle 1,6 times a year. A trailer using an internal combustion engine charger could therefore possibly be a useful item to rent for the one or two occasions per year when it is necessary to travel long distances. The first and only car constitutes about 50% of the total number of vehicles on the road in the Republic and the second car about 25%.

Trip statistics for light delivery vehicles (LDV's) used in municipal service would be of special interest here. (LDV's referred to here are vehicles which have a payload of between 400 kg and 1 500 kg but do not include panel vans). Table I summarises this information[3]:

TABLE I
DAILY DISTANCES TRAVELLED BY MUNICIPAL LDV'S PER NORMAL OPERATING DAY
(27 Questionnaires)

Distance categories (km)	Cumulative percentage per distance category					
	Average maximum distance			Average distance		
	Random delivery	Personal transport	Maintenance[1]	Random delivery	Personal transport	Maintenance[1]
0 — 49	0	5	0	22	45	27
50 — 99	28	35	45	78	100	91
101 — 149	80	55	55	100	100	100
150 — 199	100	90	100	100	100	100
200 — 250	100	100	100	100	100	100
Average (km)	129	132	108	75	53	67
Average (km)[2]		127			59	

Note: Maintenance LDV is actually a sub-category of personal transport, but is given separately since various municipalities gave it separately in their breakdown.

3) The potential market for battery driven light commercial vehicles and passenger buses in South Africa, CSIR Special Report Elek 143, Pretoria, May 1978 submitted to the Electric Vehicle Committee.

A weighted average calculated on 18% random delivery, 65% personal transport and 70% maintenance duties, gives a range of 59 km. This is well within the range capability of a lead-acid battery vehicle on one charge. An additional point of interest which emerged was that 35% of LDV's are never used for a distance longer than 100 km .

Another category which will be of interest is passenger buses. Figure 3 gives a typical utilisation pattern experienced by a fleet operator in a white urban area[3].

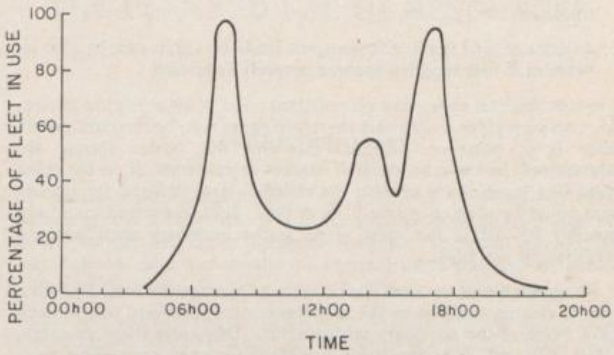


FIGURE 3

PASSENGER BUS FLEET UTILIZATION DURING A NORMAL OPERATING DAY IN A WHITE AREA

Analysis of a larger sample indicates that between 50% and 80% of buses are not used during the day between morning and afternoon peak hours. This is of interest because it allows for a boost charge during the middle of the day and a complete recharge at night. Furthermore, analysis of several bus service operations showed that the average daily distance travelled by buses in white urban areas varies between 80 km and 115 km and that 95% of the buses will do less than twice this distance per day. An analysis of trip distances showed that more than 95% of return trips in white urban areas are less than 30 km . The figures for urban black buses are between 150 km and 220 km for the average daily distance travelled, with a smaller variation from the average, however, and 90% of return trips below 16 km .

If we compare these requirements with the specification of the MAN buses (used in the GES experiment) which have a range of 80 km in traffic, we find that for white urban area applications batteries need only be changed after two return trips, which would give a good safety margin, or possibly after three trips, with a boost charge in between.

In South Africa we have two major advantages as far as battery-driven vehicles are concerned. We do not experience the extreme low temperatures which create a problem in Europe with the heating of the vehicle and also result in a reduction of specific energy of the lead-acid battery. The second is that 75% of our energy comes from coal with electric generation almost completely from this source. It is therefore of importance to us to look seriously at battery-driven vehicles to carry out our short trip tasks within urban areas. Not only is it a good investment in the short term as far as security of service is concerned, but it is also a good long-term investment because battery electric vehicles will definitely have to play a bigger role in the changing energy balance of the world in future, as we are moving closer towards large scale use of nuclear and eventually solar energy.

MR. G. J. NORTJE, Germiston:

It is generally accepted that a serious international shortage of petroleum fuels will not be experienced before the year 2000. It is therefore readily understandable that there is little, if any, pressure to introduce electric vehicles on a large scale.

In this country the situation is somewhat different, as we are continually facing the threat of an oil embargo. In fact we are at present facing a possible petroleum shortage. The timing of Dr. Hind's paper is therefore excellent.

Dr. Hind states that electric vehicles are not attractive to the private motorist, who requires flexibility and does not wish to preplan his daily transport requirements to fit in with its limitations. This, combined with the fact that he would have to pay a much higher price for the electric vehicle on the strength of the promise that he may be on the winning side in ten years time, is unlikely to appeal to many, as long as petroleum supplies are available.

This is a very unfortunate situation, as the greatest potential for electric vehicles lies in the private car market.

In the report: "The expected influence of electric vehicles on the demand for petroleum in South Africa" published by the CSIR, it is concluded that:

1. 26% of motor cars could be replaced with electric vehicles in the present state of development, if replacement is confined to second cars only. The potential fuel saving would be 21% of fuel consumption by motor vehicles and about 10% of total fuel consumption for road transport.
2. In the case of commercial vehicles the potential market for vehicles up to 1 000 kg load capacity is approximately 18%. The potential fuel saving is of the order of 4% of the total consumption for road transport.
3. At least 66% of motor car transport could be taken over by electric vehicles if fuel supplies become severely restricted.

From both a fuel saving and air pollution point of view, the use of electric cars to replace motor cars therefore appears to be the most rewarding. It is, however, accepted that this will, under normal circumstances, be the most difficult market to penetrate. If on the other hand fuel supplies are severely restricted, a large demand for electric cars could be created within a short time. Such a demand could not possibly be met in the short term, as the necessary manufacturing facilities do not exist.

It is suggested that the time has come to encourage the local manufacture of electric vehicles by the larger motor corporations, who already have much of the necessary infrastructure. Obviously these manufacturers will not consider local manufacture until such time as a reasonable demand for these vehicles has been created. To create a demand it appears that two things have to happen:

> Firstly the price of the electric vehicle has to be reduced to a level at least comparable with that of the i.c. engine vehicle.
>
> Secondly, wide publicity must be given to the advantages of electric vehicles and they must be seen in regular operation by the broad public.

The prices of electric vehicles can for the present only be reduced if subsidised. Such subsidy could be financed by increasing the excise duty on other vehicles.

This approach should be readily acceptable as being in the national interest. Initially vehicles would have to be wholly imported and such importation should be duty free and subsidised, if necessary.

It is suggested that local authorities have an important role to fulfil in publicising the use of electric vehicles, by taking the lead in introducing such vehicles into their transportation fleets. All of the larger local authorities could provide funds for the purchase of a limited number of electric vehicles during the next financial year.

It is suspected that unless local authorities take such a step, we will still be talking about the possible introduction of electric vehicles in 5 years time. Maintenance, a factor which must be discouraging to private fleet owners, should not present a problem to electricity supply undertakings.

Ideally, arrangements should be made for the combined purchase of electric vehicles in collaboration with the CSIR.

If this action is taken now, then at least a small number of electric vehicles will be seen in daily use in the larger centres in the near future.

MR. M. P. P. CLARKE, Randburg:

Dr. Hind's paper and Mr. Robertson's presentation make it clear that electric powered vehicles are practical, economical and available, and Mr. Hough in his address re-emphasised the urgency of our need to find alternative sources of power with special reference to our country's transport needs. Are we not in danger of now doing too much talking and too little acting?

I would like to see a **SPECIAL** letter to each and every Member, Affiliate and/or Associated Organisation exhorting them to select at least one, and in the case of major users like the G.P.O., S.A.R., Escom and larger Municipalities, etc., perhaps 10 or 100, electric vehicles most nearly suited to their requirements. Order it NOW, put it into service as soon as possible and keep accurate records of its performance. This will surely not "break the Bank of Monte Carlo", even though the capital costs of those vehicles are higher than their petrol driven counterparts, and it will give us a very important item for consideration at our Welkom and/or Durban meetings, and who can predict the impact that this would have on a National scale . . . it's worth considering in a most serious light.

MR. K. J. MURPHY, Somerset West:

Mr. President, Lady and Gentlemen — actually, what I have to say is only partly about battery-powered vehicles. Mr. President, we are being urged from all quarters to save electricity, that is, energy demand, etc., regardless of the consequences.

Should we not concentrate our efforts on the wiser use of electricity as suggested by Mr. Barnard? I should like to know from Escom just how much we have to save to achieve a saving in the cost of electricity to ourselves, and also to extend the life of our natural coal reserves which we are now exporting.

Them just another thought, quite innocently you know, last Saturday there I was washing my motorcar when suddenly I heard a little voice, my petrolcap fell off, low and behold it was the fuel talking to me and asking me, "why are you wasting your time here when with my four additives you could be out driving in the country side". This is just another thought.

Meneer die President, toe ek so 'n jong vakleerling was, en die eerstekeer begin leer het van die elektro-tegniek, het ek tot die gevolgtrekking gekom dat ek die volmaakte ontdekking gemaak het, en ek het nie eers 'n battery nodig gehad nie, want u weet, ek het gereken jy sit nou net die klein 'dynamo' voor aan op die voorste wiel van die trapfiets, met 'n transformator hier op die 'bars', soos ons gesê het, en dan 'n sterk motor op die agterwiel, en daar het jy dit: jy wek dit voor op en agter stoot jy hom.

Ek het dit toe nooit gedoen nie, maar miskien kan die mense wat die voertuie ontwerp dit net in gedagte hou vir die toekoms.

Verder, het ek vandag 'n motor wat baie elektries is, nie die enjin nie, maar andersins, elektriese vensters, elektriese lugreëlaar, liggies op alle moontlike en onmoontlike plekke, en toe ek vanmore by die motor kom, toe ek die ding wou aanskakel, toe kan u raai, was die battery pap. So, dit is ook 'n gedagte om te onthou.

Baie dankie mnr. die President.

MR. P. J. W. ROBINSON, Crompton Electricars Ltd.,

Mr. President, Gentlemen — I certainly have to acknowledge the excellent work that is being done in Germany to evaluate electric vehicles for commercial applications; I have been to Germany and I have seen some of the vehicles that are being produced there, and they are really very highly developed and very successful. I think the point must be made that they are not produced on a commercial basis. They are simply produced for evaluation, and this basically is the problem that one comes to when one looks at the electric car. It's beyond dispute, I think, that in the second car category particularly, you are looking at very, very low mileages, but by the same token most second cars are in fact not new cars; they are usually secondhand cars, as mine certainly is. To produce an electric car has certainly been done, but it has been done in limited quantities, never in sufficient quantities to reduce the cost to a level which at this time under these circumstances is acceptable to the consumer. It is hoped this will change and we certainly look forward to production of a lot more electric vehicles for both private and commercial use.

Thank you very much gentlemen, Mr. President.

MR. P. J. BOTES, President:

Thank you, Mr. Robinson, we appreciate the fact that you have come all the way from the UK to deliver this paper on this very important subject. Your presentation was well received by all and on behalf of the Association please accept this small gift as a mark of our appreciation.

TOEPASSING VAN LASBESTUUR IN ELEKTRISITEITS-VOORSIENINGSONDERNEMINGS

DEEL I: DIE BEPLANDE GEBRUIK VAN HULPBRONNE

deur W. Barnard

Pr. Ing., B.Sc. (Ing.)
G. Ing., FIEE, G(SA)IEI

DEEL II: DIE DINAMIKA VAN LASBEHEER

deur G. R. Marloth
B.Sc. (Ing.), M.Sc. (Ing.)
L(SA)IEI

In sy boek "The Practice of Management", omskryf Peter F. Drucker die bestuurswese as "die maatskappy se orgaan wat spesifiek daarmee belas is om hulpbronne produktief te maak".

Die uitdrukking "lasbestuur" wat algemeen in die elektrisiteitsvoorsieningsbedryf gebruik word, verwys gewoonlik na die talle verskillende aspekte van die beplanning en bedryf van 'n elektrisiteitsvoorsieningstelsel. Dit is die voorneme om net twee sulke funksies in die referaat te behandel, naamlik **Die Beplande Gebruik van Hulpbronne** en **Die Dinamika van Lasbeheer.**

APPLICATION OF LOAD MANAGEMENT IN ELECTRICITY SUPPLY UNDERTAKINGS

PART I: THE PLANNED USE OF RESOURCES

by W. Barnard

Pr. Eng., B.Sc. (Eng.)
C. Eng., FIEE, FSAIEE

PART II: DYNAMICS OF LOAD CONTROL

by G. R. Marloth

B.Sc. (Eng.) M.Sc. (Eng.)
MSAIEE

Peter F. Drucker in his book, The Practice of Management, defines management as "the organ of society specifically charged with making resources productive".

The expression of "load management" commonly used in the electricity supply industry, generally refers to the many different aspects of planning and operating an electricity supply system and it is proposed in this paper to deal with only two such functions, viz. **The Planned Use of Resources** and **The Dynamics of Load Control.**

DEEL I: DIE BEPLANDE GEBRUIK VAN HULPBRONNE

Mr Wessel Barnard.

PART I: THE PLANNED USE OF RESOURCES

CURRICULUM VITAE

Mr Wessel Barnard was born in Villiersdorp on 11 September 1921. After one year at Helpmekaar Hoërskool Wessel went to the Johannesburgse Ambagskool (later to become John Orr Technical School). He matriculated there and started an apprenticeship with the Johannesburg City Council.

In the War years he completed his apprenticeship and became the first Council apprentice to receive a bursary to go to University. After completing his first year at University he joined the Defence Force and saw active service for two years before the War ended.

On his return he completed his degree and joined English Electric in England for two years to gain some experience. Then it was back to the Council.

Having served in various sections of the Electricity Department for 30 years he reached the top of the ladder when he succeeded Mr D. C. Plowden as City Electrical Engineer.

Mr. Barnard is a member of various bodies in the electrical field and he represents the South African municipalities on the World Energy Conference.

It can be said that Mr Barnard married in the Department as his wife, Iona, used to be secretary to the General Manager for many years. They have two sons.

1. Ter Inleiding

Die algemene doelwit van 'n leweringsliggaam is om sy verbruikers tevrede te stel deur 'n toevoer van aanneemlike gehalte te verskaf, veral deur die instandhouding van standaardspannings, frekwensie, 'n goeie golfvorm en kontinuïteit teen 'n billike prys. Lasbestuur moet dié doelwitte ondersteun.

Die fisiese grootte en die sosiale aspirasies van 'n bevolking lewer die primêre dryfkrag vir die groei van die ekonomiese stelsel. Na gelang die Bruto Nasionale Produk van 'n volk toeneem, neem die vraag na die gebruik van energie ook toe. Dit gebeur omdat dit die kombinasie van arbeid, grondstowwe, kapitaaltoerusting en energie is wat goedere en dienste tot stand bring.

Energie is dus 'n primêre invoer wat noodsaaklik is vir alle seksies van die ekonomie en die gebruik daarvan is wesenlik aan die Bruto Nasionale Produk gekoppel. As ons aanneem dat ons graag wil hê dat ons Bruto Nasionale Produk moet groei (en dit wil ons gewis,) is dit ook ge-

1. Introduction

The objective of a Supply Authority is generally to satisfy its consumers by providing supply of an acceptable quality, in particular by maintaining standard voltages, frequency, good wave form and continuity at fair prices. Load management must support these objectives.

The physical size and social aspirations of a population provide the primary driving force for the growth of the economic system. As the Gross National Product of a nation increases, so do its demands for the use of energy. This is because of the fact that it is the combination of labour, raw materials, capital equipment and energy which creates goods and services.

Energy then is a prime input, essential to all sections of the economy and its use is intrinsically linked with Gross National Product. On the assumption that we wish our Gross National Product to grow, and surely we do, our energy requirements will grow. Our concern then is not to conserve the energy that is contributing to our economic well-being, but

CUT YOUR ENERGY COSTS with CYCLOCONTROL mains signalling system

- **Automatic or manual load control**
- **Compact construction**
- **Integral PERM demand controller available**
- **No tuning or attenuation problems**

The new CYCLOCONTROL Load Control System will help Municipalities control domestic geysers and space heating at a considerably more economic outlay than previously possible.

CYCLOCONTROL transmits switching signals over the electricity mains but differs from the ripple control approach in that it operates at 50 Hz.

The use of solid state technology has resulted in a compact equipment design. Single or multi channel receivers for switching up to 80 A can be provided.

Savings of up to 40 per cent on energy costs have been reported from present users.

For further details please write or phone for Publication M3-004A

MEASUREMENTS DIVISION

GEC

People working hard for South Africa

GEC Power Distribution (Pty) Ltd

P.O. Box 13024 Knights 1413, Tlx 8-3512, Tel. 826-3536

Branches: Cape Town, Tel. 53-7900; Durban, Tel. 32-8491/8; Bloemfontein, Tel. 8-9491; Pretoria, Tel. 3-5704; Port Elizabeth, Tel. 4-901; Welkom, Tel. 2-3295; Nelspruit, Tel. 2148

Kirby Kenyon Advertising 5398

wis dat ons energie-behoeftes sal toeneem. Ons bemoei ons dus nie om die energie wat tot ons ekonomiese welvaart bydra te behou nie, maar om vermorsing uit te skakel. Die belangrikheid van maatreëls vir die besparing van energie moenie onderskat word nie, en in dié verband kan mens gerus die voorbeeld van die Amerikaanse regering navolg. Hulle het 'n boekie, "Tips for Energy Savers", met 'n persoonlike aanbeveling deur die President uitgegee.

Die uitskakeling van vermorsing is dus die klaarblyklikste metode om energie-behoeftes te verminder. Deur lasbeheer ten opsigte van aanvraag kan die benutting van bestaande geriewe bevorder word, maar benewens die sekondêre uitwerking as gevolg van 'n verminderde toekomstige vraag na kapitaal toerusting en 'n verminderde gebruik van ondoeltreffende spitsontwikkelingstoerusting, sal dit nie die totale energiebehoeftes regstreeks verminder nie.

Hoewel slegs elektrisiteitsvoorsiening in dié referaat ter sprake is, is daar geweldige ruimte vir die verbeterde benutting van hulpbronne in feitlik alle dienste waar gebruik die funksie is van sosiale gebruike en bedrywighede en dus 'n onreëlmatige patroon van spits- en slaptye volg. Dink maar, om slegs enkele voorbeelde behalwe elektrisiteit te noem, aan water, riolering en vervoer, waar die gebruikskoers nie bestendig is nie en die verhouding van gemiddeld tot spits gewoonlik heelwat minder as 100% is.

In Transvaal met sy milde klimaat en kort, skerp winters, kom 'n groot vraag na elektrisiteit elke jaar net 'n paar uur lank voor. Die afspitsing van dié spits sal 'n verbeterde benutting en aansienlike besparings meebring. Johannesburg is 'n tipiese voorbeeld. Die jaarlikse lasfaktor het gedurende die afgelope 15 jaar nooit 50% oorskry nie ten spyte van aansienlike aansporings vir verbruikers om hul lasfaktor te verbeter. (Figuur 1). Die geïnstalleerde kapasiteit van die ontwikkelingsaanleg is nagenoeg 1 000 MW en slegs die helfte van dié kapasiteit word dus ten volle benut. 'n Teoretiese lasfaktor van 100% sal die kraglewering laat verdubbel met 'n gevolglike kapitaalbesparing, teen sê R500/kW, van R500 miljoen.

As mens verder die besparing op die koste van die transmissie- en distribusiestelsels in aanmerking neem, sal die besparing waarskynlik twee maal so groot wees. Die beheer van spitstydaanvraag met die gevolglike verbetering van die lasfaktor moet dus die meeste aandag geniet.

Daar moet aan sowel onregstreekse beheer (ontwerp, tariewe, regulasies, ens.) as aan regstreekse beheer (lasafwerping, energie-opberging, ens.) van elektrisiteitsgebruik aandag geskenk word.

2. Onregstreekse Beheer

(a) *Tariewe en Regulasies*

Elektrisiteitstariewe kan gestruktureer wees om aansporing te verskaf vir verbetering van die lasfaktor en groter gebruik gedurende nie-spitstye en slaptye.

Inderdaad gee die nuwe Johannesburgse tarief kortings van tot 35% op energieheffings vir 'n 100%-lasfaktor en kortings van 50% op aanvraagheffings vir laste wat gedurende die stelselspitstyd onderbreek kan word.

Die meeste plaaslike owerhede het regulasies wat 'n verbruiker se arbeidsfaktor beheer. Dié regulasies moet nie net toegepas word om die koste van kragaankope van Evkom te verhaal nie (waar die Leweringsliggaam op 'n kW-grondslag vir aanvraag aanslaan), maar ook met die doel om die verliese op die distribusiestelsel tot die minimum te beperk.

(b) *Stelselontwerp*

Goeie lasbestuur behels die sorgvuldige oorweging van faktore soos spanningspeile, stelselverliese en noodwendigheid van toevoer in die stelselontwerp. Benewens baie moontlike maatreëls om vermorsing te beperk, moet daar selfs oorweeg word om doeltreffender dampligte vir straatverligting aan te bring.

In Johannesburg maak die totale stelselverliese sowat 8% van alle energie wat verkoop word, uit, en teenswoordig dra dit ongeveer 100 MW tot die stelselspitsaanvraag by. Na raming is die verliese in die oorspronklike 80/20/6,6 kV/380 V-stelsel wat nog steeds 28% van Johannesburg se totale aanvraag verskaf, so groot dat hul gekapitaliseerde koste die vervanging van al die distribusie-aanlegte met moderne 80/11 kV/380 V-toerusting en korrel-georiënteerde staaltransformators meer as sal dek. Die huidige beperkings op kapitaaluitgawes en die tyd en arbeid wat vir die omskakeling nodig sal wees, belet die onmiddellike aftakeling van die hele oorblywende 80/20/-6,6 kV/380 V-stelsel. Dit moet dus geleidelik uitgefaseer word na gelang die geleentheid hom voordoen.

to eliminate wastage. The importance of measures for the saving of energy should not be under-estimated and one could take a leaf out of the booklet "Tips for Energy Savers" issued by the United States Government with a personal endorsement from the President.

Elimination of wastage then, is the most obvious approach to reducing energy needs. Load management in respect of demand is a means of improving the use of existing facilities, but except for its secondary effect through reduced future demand for capital equipment and reduced use of inefficient peak generating plant, it does not directly reduce total energy requirements.

Although we are only dealing with electricity supply in this paper, there is tremendous scope for the better utilization of resources in virtually all services where usage is a function of social custom and activity and therefore follows an irregular pattern of peaks and valleys. To quote but a few examples other than electricity, consider water, sewerage and transport, where rate of use is not constant and the ratio of Average to Peak is usually considerably less than 100%.

In the Transvaal, with its mild climate and short severe winters, a high demand for electricity occurs for only a few hours each year and the levelling of this peak would result in improved utilization of resources and substantial economies. Johannesburg is a typical example. The annual load factor over the last 15 years has never exceeded 50% in spite of substantial incentives for consumers to improve their load factors. (Figure 1). The installed capacity of generating plant is approximately 1 000 MW and therefore only half of this capacity is fully utilized. A theoretical load factor of 100% would result in doubling the power output with consequent capital saving, at say R500/kW, of R500 million.

If one further takes into account the saving on the cost of transmission and distribution systems, this figure would probably be doubled. The control of peak demand with the resulting improvement in load factors must therefore be the area receiving major attention.

Consideration should be given to both Indirect Control (design, tariffs, regulations, etc.) and Direct Control (load shedding, energy storage, etc.) of electricity usage.

2. Indirect Control

(a) *Tariffs and Regulations*

Electricity supply tariffs can be structured to provide incentives for improving load factor, for greater usage during off-peak or valley periods.

In fact, Johannesburg's new tariff will give rebates of up to 35% on energy charges, for a 100% load factor and rebates of 50% on demand charges for load that can be interrupted during system peak periods.

Most local authorities have regulations governing a consumer's power factor. These regulations should be applied not only to recover the cost of purchasing power from Escom, where the Supply Authority charges for demand on a kW basis, but also in order to reduce to a minimum the losses on the distribution system.

(b) *System Design*

Good load management includes careful consideration in system design of factors such as voltage levels, system losses and essentiality of supply. Among many possible measures to reduce wastage, consideration should even be given to the introduction of more efficient vapour lamps for street lighting.

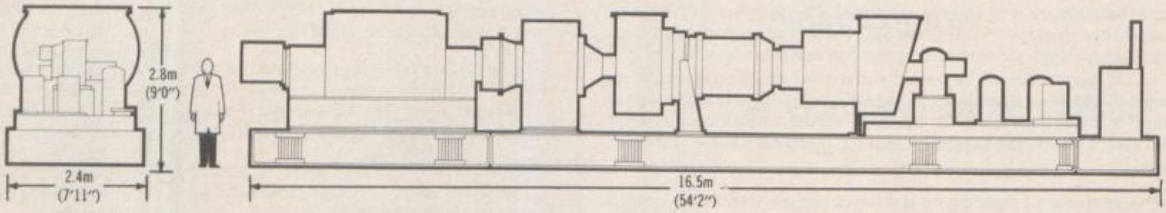
In Johannesburg, total system losses amount to approximately 8% of all energy sold and presently contribute about 100 MW to system peak demand. It has been calculated that the losses in the original 80/20/6,6 kV/380 V system which still supplies 28% of Johannesburg's total demand, are so large that their capitalized cost would more than pay for the replacement of all distribution plant with 80/11 kV/380 V equipment of modern design and grain-orientated core steel transformers. The present restrictions on capital expenditure and the time and labour required to make the conversion, prevents the immediate scrapping of the whole remaining 80/20/6,6 kV/380 V system, and it therefore has to be phased out gradually as opportunity permits.

MEISSNER

GAS TURBINE POWERED GENERATING SETS

900 KW to 8,6 MW

Lightweight, Compact, Reliable and Versatile



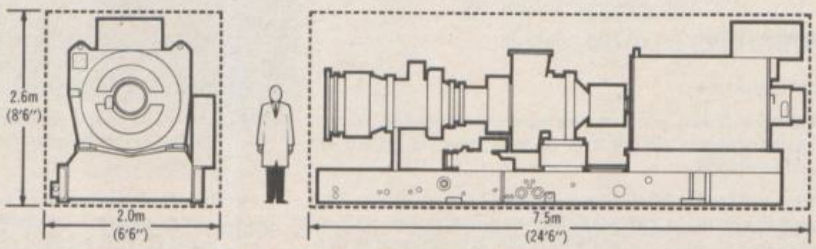
APPROX. WEIGHT: 63 500 kg (140,000 LBS.)

MARS 8,6 MW Sea Level

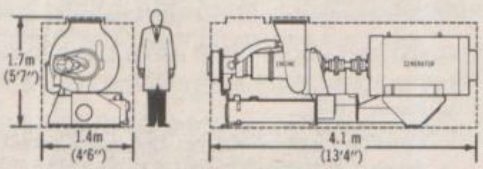
Let any one or a combination of these Solar Gas Turbine Generating Sets take care of your Emergency Power and Peak Lopping requirements.

CENTAUR 3MW Sea Level

The Solar range of INDUSTRIAL Gas Turbines incorporated in these packages ensures a long and trouble free life with minimum maintenance.



APPROX. WEIGHT: 18 144 kg (40,000 LBS.)



APPROX. WEIGHT: 5 200 kg (11,500 LBS.)

SATURN 900 KW Sea Level

Let the South African Generating Plant Specialists investigate your Emergency Standby and Peak Lopping requirements.

Let the South African Generating Plant Specialists investigate your Emergency Standby and Peak Lopping requirements.

H. G. MEISSNER & CO. (PTY) LTD

29/31 MEWETT STREET, OPHIRTON,
P.O. BOX 10867, JOHANNESBURG. Phones: 838-4714/5

(c) *Verbruikervoorligting*

Die waarde van verbruikervoorligting vir die uitskakeling van vermorsing en vir die doeltreffende benutting van elektriese energie moenie onderskat word nie. Dit geld veral vir die huishoudelike verbruiker (die huisvrou) wat waarskynlik nie weet dat daar 200 watt-tungstenlig met 'n 25 watt-fluoresseerlig wat ewe veel lig gee, vervang kan word nie.

Dit is gewis tyd dat die VMEO 'n publisiteitsveldtog op tou sit om die benutting van elektriese energie deur al sy huishoudelike, kommersiële en nywerheidsverbruikers te bevorder.

3. Regstreekse Beheer

Daar is geen regstreekse metode waarop die Leweringsliggaam die toevoer van energie aan sy verbruikers kan beheer nie. Selfs 'n algehele kragonderbreking stel die meeste van die energieverbruiking net tot 'n gerieflikher tydstip uit. Wanneer die stroom weer aangeskakel word, moet die hitte wat verlore is en die werk wat nie verrig kon word terwyl die elektrisiteit nie beskikbaar was nie, ingehaal word, dus word daar min energie bespaar. Die enigste vermindering in die verbruik is ten opsigte van verligting wat teenswoordig 'n betreklike klein proporsie van die totale energieverbruik uitmaak.

Die Leweringsliggaam moet dit egter oorweeg om die aanvraag op sy stelsel te beheer deur die onderbreekbare las tydens die spitstyd af te skakel en om verder die aanvraag wat tydens die spitstyd ingevoer moet word, met behulp van spitslastoerusting te verminder.

'n Leweringsliggaam kan tot sowat 20% van sy stelselspitsaanvraag doeltreffend regstreeks beheer deur maatreëls soos:

(a) Om voerders met 'n lae voorrang op sekere tye af te skakel ("verdonkering");

(b) Spanning- en frekwensievermindering tydens spitstye ("verskemering");

(c) Spitslasbegrensers by die verbruikersinlaatpunt;

(d) Selektiewe afskakeling van uitstelbare laste, òf outomaties òf deur afstandbeheer.

Al dié metodes word algemeen toegepas, maar elk lewer sy eie probleme op. Die onwenslikste manier om die stelsellas te beheer, is om voerders by substasies af te skakel. Dit is naamlik moeilik om tussen lae en hoë las voorrange te differensieer. Om lasspreiding te benut, is dit wenslik dat voerders 'n gemengde las moet verskaf. Die duur van onderbrekings wat verbruikers kan duld, verskil ook na gelang van die tyd van die dag.

Saans sal daar gewoonlik slegs kort onderbrekings af en toe geduld word, hoewel huishoudelike verbruikers dalk nie ernstig begaan sal wees oor onderbrekings van tot een uur in die middel van die oggend nie.

Dit is die mening dat dié metode van lasbeheer net vir noodtoestande geskik is. Om vir die verlies van Evkom-krag voorsiening te maak, is Johannesburg tans besig om 'n stelsel te installeer wat daarop gemik is om las af te werp deur substasievoerders outomaties op 'n voorafbeplande grondslag af te skakel sodra die toevoerfrekwensie onder 49,5 Hz daal. Ander munisipaliteite werk saam in 'n soortgelyke skema wat deur Evkom ontwerp is om die gevaar van 'n landwye verdonkering as gevolg van die verlies van 'n groot generator of transmissiebaan te verminder.

Spanningsvermindering op weerstandslaste word selektief in Johannesburg toegepas. Dit gaan mank aan dié nadeel dat baie verbruikers toestelle soos televisie, verligting en rekenaars het wat spanningsensitief is. Algemene oormatige spanningvermindering lok verbruikersklagte en selfs eise teen die Leweringsliggaam vanweë skade aan toestelle uit. Spanningvermindering het geen uitwerking op die lewering van elektriese motors nie. Induksiemotors soos wat in yskaste en swembadpompe gebruik word, sal eenvoudig meer stroom teen 'n laer arbeidsfaktor trek en as die baanwerk nie 'n toereikende beskermingstoestel bevat nie, sal dit oorverhit en kan permanente skade opdoen.

Spitslasbegrensing van afsonderlike verbruikers, hetsy deur die beperking van die grootte van die verbruiker se hoofstroombreker of die afskakeling van opgaarwaterverwarmingstoestelle sodra die verbruiker se las 'n voorafbepaalde peil bereik, verg nie duur apparaat nie. Dié metode is egter van beperkte nut en gaan mank aan die nadeel dat die verbruiker wie se spitsaanvraag nie met dié van die Leweringsliggaam oor-eenstem nie, gedurende slaptye beperk word.

Die bevredigendste manier om aanvraag te verminder, is om uitstelbare laste gedurende die spitstye af te skakel. Twee metodes wat dikwels gebruik word, is om tydskakelaars by die verbruiker se perseel te installeer of deur middel van afstandbeheer. Die afstandbeheerstelsel is verkieslik omdat die totale koste van die installering en instandhouding

(c) *Consumer Education*

The value of consumer education in the elimination of waste and efficient use of electrical energy should not be under-estimated. This applies more particularly to the domestic consumer (the housewife), who is unlikely to know that her 200 watt tungsten light could be replaced by a 25 watt fluorescent lamp having the same light output.

It has certainly become necessary for the AMEU as a body, to embark on a publicity campaign for the better utilization of electrical energy by all its consumers, domestic, commercial and industrial.

3. Direct Control

The Supply Authority has no direct means of controlling the supply of energy to its consumers. Even a total power cut only defers most energy usage till a more convenient time. When power is restored, the heat lost and work not done while electricity is not available must be made up, so there is little energy saving. The only reduction in consumption is with respect to lighting, which today represents a relatively small proportion of total energy use.

Consideration must however, be given by the Supply Authority to controlling the demand of its system by switching off interruptable load during peak and further reducing the demand to be imported over peak by the use of peaking plant.

A Supply Authority can effectively directly control up to about 20% of its system peak demand by measures such as:

(a) Switching out low priority feeders at certain times ("black outs");

(b) Voltage and frequency reduction over peak periods ("brown outs");

(c) Peak load limiters at the consumer's point of entry;

(d) Selective disconnection of deferable loads, either automatically or by remote control.

All methods are widely adopted, but each has its own problems. The least desirable method of controlling the system load is by the switching out of feeders at substations, because it is difficult to differentiate between low and high priority load. To take advantage of load diversity, it is desirable that feeders supply a mixed load. The length of outage which can be tolerated by consumers also varies with time of day.

Only infrequent short duration outages will normally be accepted in the evenings, whereas domestic consumers may not be seriously concerned about mid-morning outages of up to an hour.

It is considered that this method of load control is only suitable for emergencies. To cater for loss of Escom power, Johannesburg is currently installing a system designed to shed load by automatically switching-out substation feeders on a pre-planned basis, when the supply frequency falls below 49,5 Hz. Other municipalities are co-operating in a similar scheme designed by Escom to reduce the risk of a nation-wide blackout being initiated by loss of a large generator or transmission circuit.

Voltage reduction on resistive loads is practiced selectively in Johannesburg. It suffers from the defeat that many consumers have appliances such as television, lighting and computers which are voltage sensitive. General excessive voltage reduction gives rise to consumer complaints and even claims against the Supply Authority for damage to appliances. Voltage reduction has no effect on the output of electric motors. An induction motor such as used in refrigerators and swimming pool pumps, will simply draw more current at a lower power factor and if circuitry does not include an adequate protective device, will overheat and may be permanently damaged.

Peak load limiting of individual consumers, either by limiting the size of the consumer's main breaker or by switching out storage water heaters when the consumer's load exceeds a pre-determined level, calls for no expensive apparatus. However, this is of limited value and suffers from the defect that the consumer whose peak demand does not coincide with that of the Supply Authority's is limited during valley periods.

The most satisfactory means of reducing demand is by disconnecting deferable loads during peak periods. Two frequently used methods are time switches installed at consumer's premises, or by remote load control. The remote load control system is favoured because the overall installation and maintenance costs are lower if applied to all consumers,

minder is as dit op alle verbruikers toegepas word en omdat die beheer buigsamer is. Beheertydperke kan onmiddellik gevarieer word om verskillende lasbehoeftes te pas. "Rimpelbeheer" is die afstandlasbeheerstelsel at die algemeenste gebruik word en die meeste Leweringsliggame in Europa sowel as baie Suid-Afrikaanse munisipaliteite het die stelsel op 'n gedeelte van, of op hul nette geïnstalleer vir die beheer van huishoudelike opgaarwaterverwarmingstoestelle.

Johannesburg is voornemens om die aanwending na kommersiële grootmaat-opgaarwaterverwarmingstoestelle en ondervloerse verwarmers uit te brei deur 'n spesiale tarief te laat geld vir onderbreekbare las van groot verbruikers wat gedurende die stelselspitstyd afgeskakel word.

4. Spitskragontwikkeling

Daar word algemeen in die Republiek aanvaar dat net Evkom oor die hulpbronne beskik om 'n moderne nuwe steenkool-gestookte, 'n kern- of 'n hidro-elektriese kragsentrale van redelike grootte te bou en te bedryf. Die stygende kapitaalkoste van sulke kragsentrales en van die gepaardgaande groot transmissienet wat vir hul ekonomiese werking nodig is, sowel as die behoefte om 'n deel van dié hoë kapitaalkoste binnelands te verkry, het Evkom egter verplig om sy aanvraagheffings te verhoog. Die toestand het nou ontstaan dat al Evkom se aanvraagverbruikers ernstig moet oorweeg of hulle nie 'n gedeelte van hul eie spitsaanvraag meer ekonomies self kan ontwikkel nie, as om dit vir betreklike kort tydperke van Evkom te neem. Op die aangehegte Figuur 2 word die jaarlikse lasduurkromme vir Johannesburg aangetoon. Die vorm is tipies vir munisipaliteite met 'n aansienlike besigheids- en nywerheidslas. werheidslas.

Uit dié kromme blyk dit dat hoewel die bedryfskoste van Johannesburg se beplande bykomende gasturbineontwikkelingskapasiteit van 135 MW, sowat 6 sent per kWh sal wees, dit net 100 uur lank teen 'n gemiddelde van die halwe maksimum kapasiteit hoef te werk en 6 750 000 kWh teen 'n totale jaarlikse koste van R337 500 moet ontwikkel om vir Johannesburg R4 927 500 aan Evkomaanvraag- en -energieheffings teen die huidige tarief te bespaar. Die netto jaarlikse besparing van R4,59 miljoen sal die totale installeringskoste (ongeveer R18 miljoen) binne vier jaar betaal. Omdat so 'n aanleg naby die las geleë kan wees en as sinchrone kapasitors vir arbeidsfaktorkorreksie kan dien, is daar verdere besparings ten opsigte van die distribusie- en transmissiekostes.

Hoewel Johannesburg van plan is om spitskragontwikkeling met oliegasturbines wat vir nood-toevoer geïnstalleer is, te verskaf, is dit nie die enigste moontlike manier nie.

Die noodsaaklike vereiste vir enige metode om aanvraagheffings vir kraginvoere te verminder, is egter dat die totale wederkerende koste van die skema (dit wil sê, onkostes soos aflossing, rente, versekering, ensovoorts wat betaal moet word of die aanleg aan die gang is of nie) beduidend minder moet wees as die aanvraagheffings vir die gelyke hoeveelheid invoerkrag. In die algemeen is die werktyd van spitstoerusting op munisipale stelsels gering* en die bedryfskoste is dus nie hoog nie, maar andersyds is 'n hoë mate van betroubaarheid noodsaaklik. In Tabel I word daar, met die oog op die vergelyking van die verskillende moontlike skemas, 'n aanduiding van die soort kapitaalkoste wat deesdae van toepassing is verstrek.

* Daar dien op gewys te word dat namate ander metodes van lasbeheer in werking tree, die spitse vlakker en breër sal word en die werktyd vermeerder sal moet word.

TABEL I: Koste van Kragopwekking (met inbegrip van EHS-transmissie)

Soort Installasie	Kapitaalkoste per kW	Benaderde werktyd per ontwikkelde kWh
Sonkrag-ontwikkeling*	R1 000 tot R10 000	Nil
Groot hidro-elektries* (Basislas)	R500 tot R1 000	0,3 sent
Klein hidro-elektries* (Spitslas)	R300 tot R400	0,3 sent
Kernkragsentrales*	R600 tot R1 000	0,6 sent
Groot kragsentrale met steenkool gestook*	R300 tot R500	0,7 sent
Groot pomp opgaar-waterskemas* (Basislashulp)	R250 tot R500	1,2 sent
Klein pomp opgaar-waterskemas (Spitslasvermindering)	R150 tot R300	1,3 sent
Druklugopberging	R225 †	2,5 sent
Gasturbines (50 MW)	R120 tot R180	6,0 sent

* Met inbegrip van EHS-transmissie vir gebruiker.
† Die 1974-beraming vir die Huntorfskema het met 10% p.j. gestyg.

and because of the greater flexibility of control. Periods of control can be immediately adjusted to suit varying load requirements. "Ripple Control" is the most widely used form of remote load control and the majority of Supply Authorities in Europe as well as many South African municipalities have installed this system on portion or the whole of their networks for the control of domestic water storage heaters.

Johannesburg is planning to extend this application to commercial bulk storage heaters and underfloor heating, by applying a special tariff to interruptable load switched off by large consumers during system peak.

4. Peak Power Generation

It is generally accepted in the Republic that only Escom has the resources to build and operate a modern new coal-fired, a nuclear or an hydro-electric power station of any size. However, the increasing capital costs of such power stations and of the associated major transmission network necessary for their economical operation, as well as the need to raise some of this high capital cost internally, has forced Escom to increase its demand charges. The situation has now arisen where all Escom's demand consumers should seriously investigate whether they are in a position to generate a portion of their own peak demand more economically than taking it from Escom for relatively short periods. The attached Figure 2 shows the annual load duration curve for Johannesburg. Its shape is typical of that of other municipalities having a fairly substantial business and industrial load.

It is evident from this curve, that although Johannesburg's planned 135 MW of additional gas turbine generating capacity will cost about 6 cents per kWh to run, it need only operate for 100 hours at an average of half maximum capacity, generating 6 750 000 kWh at a total annual cost of R337 500, to save Escom demand and energy charges to Johannesburg at current rates, of R4 927 500. The net saving of R4,59 million **annually** will pay for the total cost of the installation (approximately R18 million) in four years. Because such plant can be situated close to the load and can be run as synchronous condensers for power factor correction, there are further savings in distribution and transmission costs.

Although Johannesburg proposes to provide peak power generation from oil burning gas turbines installed for emergency supplies, this is not the only possible method.

The essential requirement, however, of any method of reducing demand charges for power imports is that the total recurring costs of the scheme, that is, those costs such as amortisation, interest, insurance, etc., which have to be met whether the plant runs or not — shall be significantly lower than the demand charges for the equivalent imported power. Generally, the running hours of peak plant on municipal systems is small,* so that high operating costs are not significant, but on the other hand, a high degree of reliability is essential. Table I gives an indication of the order of capital costs which apply today, for comparison of various possible schemes.

* It must be pointed out that as other methods of load control take effect, the peaks will become smaller and wider and the running hours will have to increase.

TABLE I: Costs of Power Generation (including EHV transmission)

Type of Installation	Capital Cost per kW	Approximate Running Cost per kWh Generated
Solar power generation*	R1 000 to R10 000	Nil
Large hydro-electric* (Base load)	R500 to R1 000	0,3 cents
Small hydro-electric* (Peak load)	R300 to R400	0,3 cents
Nuclear power stations*	R600 to R1 000	0,6 cents
Large coal-fired power station*	R300 to R500	0,7 cents
Large pumped storage* (Base load assistance)	R250 to R500	1,2 cents
Small pumped storage (Peak load reduction)	R150 to R300	1,3 cents
Compressed air storage	R225†	2,5 cents
Gas turbines (50 MW)	R120 to R180	6,0 cents

* Including EHV transmission to user.
† 1974 estimate of Huntorf scheme escalated 10% p.a.

Op Figuur 3 word 'n vergelyking getref tussen die totale bedryfskostes van dié skemas vir wisselende jaarlikse bedryfstyd. Die gemiddelde syfers is gebruik om die krommes te trek en daar is aangeneem dat die jaarlikse rente en aflossing 10% bedra en dat die bedryfsleef-tye ewe lank is. Dit moet dus nie geskik vir praktiese toepassing gereken word nie, maar moet eerder beskou word as 'n grondslag vir 'n ondersoek na lewensvatbaarheid en koste-opbrengs.

Uit dié krommes wil dit voorkom dat dit, selfs teen die teenswoordige oliepryse, nie ekonomies is om gasturbines meer as sê 500 uur per jaar te laat werk nie, en 'n klein pomp opgaarwater- of hidro-elektrieseskema wat spesifiek ontwerp is om teen 'n maksimum tydperk van twee uur per dag te werk, mag miskien meer ekonomies wees as 'n steenkoolgestookte kragstasie.

5. Energie-opberging

Die gedagte om energie gedurende slaptye te ontwikkel vir opberging en herwinning om voorrade tydens spitstye aan te ja, is nie nuut nie. Daar is hidro-elektriese pomp opgaarwaterskemas dwarsoor die wêreld op geskikte terreine waar water van 'n laer opgaardam gedurende die nag na 'n hoër liggende opgaardam gepomp word en gedurende die dag gebruik word om krag in water turbines op te wek. Dit word geïllustreer deur verwysing na 'n tipiese daaglikse laskromme van 'n groot voorsieningsonderneming soos die Johannesburgse Stadsraad (Figuur 4). Om tegniese sowel as ekonomiese redes is dit wenslik dat groot ontwikkelaars wat vir brandstof op poeiersteenkool staatmaak, ononderbroke teen of naby sy volle kapasiteit moet werk. Dit word as 'n noodsaaklike vereiste vir kernkragsentrales beskou.

In Tabel II word 'n lys van die enigste munisipale pomp opgaarwaterskema, en enkele van die groter pomp opgaarwateraanlegte wat reeds bestaan of in aanbou is, versterk.

TABLE II: Enkele Tipiese Pomp Opgaarwaterskemas

Naam	Land	Kapasiteit in MW
Vian den	Luxemburg	900
Salina	VSA	520
Din orwic	VK	1 800
Drakensberg	RSA	1 000
Steenbras (Kaapstad)	RSA	180
Hornbergstute	Wes-Duitsland	992

Met die oog op besparings by kaoasiteitsvergroting en die enorme koste van die siviele ingeneurswerk wat daaraan verbonde is, was dit tot onlangs nie die moeite werd beskou om die moontlikhede van 'n klein pomp opgaarwaterskema te ondersoek nie. So 'n skema kan egter, in vergelyking met die koste van ingevoerde krag, ekonomies lewensvatbaar wees vir nie-selfontwikkelde voorsieningsondernemings, nie alleen as middel om die daaglikse lasfaktor (wat veral vir 'n selfontwikkelende Leweringsliggaam belangrik is) te verbeter nie, maar ook om die maandelikse en jaarlikse lasfaktors te verbeter. As dit slegs vir geleentheids spitslasontwikkeling oorweeg word, is die hoër koste van energie as gevolg van verliese in die pompwerk, pypwrywing en waterturbinegenerators nie so belangrik soos vir 'n pomp opgaarwaterskema in gereelde daaglikse gebruik nie.

Mits daar 'n terrein beskikbaar is waar die kapitaalkoste vir die betrokke siviele werk laag is, is prestasie van hoë, omvattende doeltreffendheid nie belangrik nie, en dan verskaf die aanvraagheffings vir ingevoerde krag 'n maatstaf waarteen die kostevoordele gemeet kan word.

'n Voorbeeld van so 'n klein skema is die een wat tans by Klipriviersberg vir Johannesburg oorweeg word met 'n moontlike opbergingkapasiteit van sowat 50 megawatt-uur. Klipriviersberg is 'n reeks rantjies in suidelike Johannesburg wat so steil is dat hulle meestal ongeskik is vir woongebiedsontwikkelings. Hoewel die wateropvanggebied klein is, is daar besef dat daar by 'n pomp opgaarwaterskema net gesorg moet word dat daar genoeg water beskikbaar is om verliese as gevolg van dreinering en verdamping te vervang.

Daar is 'n spruitjie in die gebied Bloubosspruit, met 'n klein reëlmatige, standhoudende stroom wat ook die stormwater van 'n groot gebied van suidelike Johannesburg wegvoer. Dié spruit vloei deur 'n valleitjie in Klipriviersberg waar daar beoog word om 'n laer liggende dam te bou wat 'n ontspanningsaantreklikheid sal wees. Uit dié dam sal water dan tydens slaptye na 'n opgaardam gepomp word wat tot stand sal kom deur 'n betonwal in 'n kloof te bou, sowat 130 meter vo die vlak van die laer liggende dam. Die maksimum kapasiteit van dié opgaardam en die betroubare jaarlikse stroom van Bloubosspruit gedurende die droë maande is natuurlik deurslaggewend in die bepaling van die lewensvatbaarheid van die projek. Aangesien daar geen vloeilesings beskikbaar is

Figure 3 gives the comparison of total operating costs of these schemes for varying annual operating hours. These curves have been plotted using average figures and assuming 10% annual interest and redemption charges and equal operating lives and should therefore not be taken as suitable for applying in practice, but rather as a basis for a viability and cost benefit study.

From these curves it appears that even at today's oil prices, it is not economical to operate gas turbines for more than say 500 hours per annum and a small pumped storage or hydro-electric scheme designed for a maximum operation of two hours per day might be operated more economically than a coal-fired power station.

5. Energy Storage

The idea of generating energy during off peak periods for storage and recovery to boost supplies over peak periods, is not new. There are hydro-electric pumped storage schemes throughout the world, provided suitable sites are available, in which water is pumped from a lower reservoir to an upper reservoir during the night and used to generate power in water turbines during the day. This is illustrated by reference to a typical daily load curve of a large supply undertaking such as the Johannesburg City Council (Figure 4). It is desirable for technical as well as economic reasons, that large generators relying on pulverized coal as a fuel should operate continuously at or near full load. This is regarded as an essential requirement for nuclear stations.

Table II lists the only municipal pumped storage scheme and some of the larger pumped storage installations existing or under construction.

TABLE II: Some Typical Pumped Storage Schemes

Name	Country	Capacity in MW
Vian den	Luxembourg	900
Salina	USA	520
Din orwic	UK	1 800
Drakensberg	RSA	1 000
Steenbras (Cape Town)	RSA	180
Hornbergstute	West Germany	992

Because of the economies of scale, and the enormous civil engineering costs involved, until recently it was not considered worthwhile to examine the possibilities of a small pumped storage scheme. However, as a means not oly of improving daily load factor (which is of particular importance for a self-generating Supply Authority), but also of improving monthly and annual load factors, such a scheme could be economically viable to non self-generating supply undertakings when compared with the cost of importing power. When considered only for occasional peak load generation, the increased cost of energy due to losses in pumping, pipe friction and water turbine generators, is less important than for a pumped storage scheme in regular daily use. Provided a site is available with low capital cost for the civil work involved, achievement of a high overall efficiency is not important, and the demand charges for imported power provide a yardstick against which to evaluate cost benefits.

An example of such a small scale scheme is one with a possible storage capacity of about 50 Megawatt hours, which is under consideration by Johannesburg for installation in the Klipriviersberg. This is a small range of hills in southern Johannesburg, which are so steep that they are largely unsuitable for residential development. Although the water catchment is small, it was realized that, for a pumped storage scheme, it is only necessary to ensure that sufficient water is available to make up losses due to drainage and evaporation.

There is an insignificant stream in the area, known as the Bloubosspruit, which has a small regular perennial flow, and also carries the storm water from a large area of southern Johannesburg. This spruit flows through a small valley in the Klipriviersberg, where it is proposed to construct a lower lake which will form a recreational amenity. From this lake, water would be pumped during off peak periods to a reservoir formed by building a concrete wall across a kloof, approximately 130 metres above the level of the lower dam. The maximum capacity of this reservoir and the reliable annual flow in the Bloubosspruit during the dry months are of course critical to establishing the viability of the project. As now flow records are available, the first step has been to con-

nie, was die eerste stap om 'n klein keerwal vir meetdoeleindes op 'n geskikte plek oor Bloubosspruit te bou, waar daar gereelde lesings gedoen word.

Voordat dié skema aangepak word, is dit noodsaaklik om al die sivieleingenieursaspekte deeglik te ondersoek. In dié stadium is dit dus nie moontlik om 'n raming van die koste te verskaf nie.

Nog 'n metode van energie-opberging wat aandag geniet, is die opberging van druklug en -gas in ondergrondse ruime. By Huntorf in Wes-Duitsland is daar 'n 290 MW-kragsentrale gebou. Die bedoeling is dat dit elke dag net twee uur lank krag sal ontwikkel om die spitsaanvraag op die bestaande stelsel te verminder. Druklug word in twee grotte opgeberg wat agt uur neem om tot hul maksimum werksdruk van 74 bar (d.w.s. 74 atmosfere) vol te maak met behulp van slaptydelektrisiteit van die roosterstelsel. 'n Kombinasie van aksiale en sentrifugale kompressors word gebruik. Die druklug word vermeng met natuurlike gas wat onder gelyke druk in 'n derde grot geberg word, en word in gasturbines gebrand om die spitstydkrag wat nodig is, te ontwikkel.

Daar is al oorweeg om 'n uitgewerkte goudmynskag aan die Witwatersrand te gebruik as 'n ekonomiese manier om ondergrondse ruime vir so 'n skema te bou. Daar is vasgestel dat die koste van die siviele ingenieurswerk nie buitensporig sal wees nie. Maar aangesien daar net een skema van dié aard in die wêreld in werking is, sal die vervaardigingskoste van kompressors, turbines en gesofistikeerde beheertoerusting ongelukkig na alle waarskynlikheid taamlik hoog wees. Die gebruik van konvensionele laedruk-gasturbines wat op lug en gas wat in grotte geberg word, werk, sal die koste van die ontwikkelingsmasjinerie verminder, en hoewel dit in 'n mate deur die verhoogde grotboukoste geneutraliseer word, word dié moontlikheid verder ondersoek.

6. Sonenergie

'n Groot gedeelte — soms word dit so hoog soos 50% gestel — van die elektrisiteit wat in Suid-Afrika ontwikkel word, word deur verbruikers in hitte omgeskep. Selfs in die winter geniet die grootste deel van die Republiek, maar veral die Transvaalse hoëveld, baie ure lank sonskyn. Suid-Afrikaners word al hoe meer daarvan bewus dat dié "gratis" energie benut moet word om elektrisiteitsverbruik vir verwarmingsdoeleindes te verminder. Omdat ons as elektrisiteitsverskaffers wesenlik daarby betrokke is, hoort ons die leiding te neem met die ingebruikneming van sonkrag-verwarmers ten einde die gebruik van elektrisiteit te rasionaliseer. Daar moet al spoedig aan die volgende stappe aandag geskenk word:

1. Die promulgering van munisipale verordeninge waarin die vereistes vir sonkragverwarming van water veral waar dit deur elektriese waterverwarmers aangevul sal word, neergelê word. Dit sal munisipale elektrotegniese ingenieurs in staat stel om in hul las- en stelselbeplanning daarvoor voorsiening te maak.

2. Wanneer 'n verbruiker sy sonkragverwarming vir water op enige manier met 'n aanja-element of met elektrisiteit aanvul, moet die gebruikstyd en aanslag van die aanvullende verwarmer streng beheer word om te voorkom dat die spitsaanvraag op bewolkte dae abnormaal styg. Dit kan met lasbegrensers of tydskakelaars bewerkstellig word, maar die bevredigendste metode is die gebruik van 'n sentraal beheerde rimpelbeheerinstallasie.

Die groot gevaar is dat as sonkragverwarming vir water algemeen aangewend word, die inkomste uit elektriese warmwatertoestelle wat net 'n paar keer per jaar gebruik word, nie genoeg sal wees om die verbonde aanvraag- en netkoste te dek nie. Dié probleem kan egter oorkom word deur 'n netontwerp wat nie vir elektriese waterverwarming gedurende spitstye voorsiening maak nie.

Dit is terloops interessant dat die ontwikkeling van elektrisiteit deur middel van sonkrag, hetsy met foto-elektriese* selle of spieëls wat op 'n stoomketel gefokus word, vir die huidige R1 000 per kilowatt oorskry en dus nie 'n praktiese proposisie is nie.

* R5 200 per kW — D. Hayes, Washington Post Outlook, Februarie 1978.

7. Noodontwikkelingsaanleg

As afsonderlike verbruikers aangemoedig sou word om hul eie noodontwikkelaars te installeer en toegelaat sou word om dit te gebruik om hul eie aanvraag te verminder, sal die stelselspits verminder word en alle verbruikers sou teoreties daardeur gebaat het. In die praktyk duik die volgende probleme op:

1. So 'n aanleg word altyd deur 'n petrol- of dieselenjin aangedryf en die koste per kilowatt is baie hoër as 'n sentraal geleë gasturbine installasie wat dieselfde brandstof gebruik en elektrisiteit vir die gemeenskap verskaf.

2. 'n Klein aanleg kry nie behoorlike aandag en instandhouding nie en wil dikwels nie vat wanneer dit benodig word nie.

struct a small measuring weir at a suitable point across the Bloubosspruit, where regular readings are being taken.

Before embarking on this scheme, it will be essential to conduct a thorough investigation into all civil engineering aspects. At this stage it is therefore not possible to provide estimated costs.

Another method of energy storage which is receiving attention, is storage of compressed air and gas in underground caverns. At Huntorf in West Germany, a 290 MW power station has been constructed. This is intended to generate for only two hours each day, to reduce peak demand on the existing system. Compressed air is stored in two caverns, which take eight hours to fill to their maximum working pressure of 74 bar i.e. 74 atmospheres using off-peak electricity from the grid system. A combination of specially designed axial and centrifugal compressors is used. The compressed air is mixed with natural gas (stored under similar pressure in a third cavern) and burned in gas turbines to generate the peak power required.

Some thought has been given to the possibility of using a worked-out gold mine shaft on the Witwatersrand as a means of economically constructing underground caverns for a similar scheme, and it has been established that the civil engineering costs would not be excessive. Unfortunately, with only one such scheme in operation in the world, the development costs of compressors, turbines and sophisticated control equipment would probably be fairly high. The use of conventional low pressure gas turbines operating on air and gas stored in caverns, would reduce the cost of generating plant and although this would be offset to some extent by increased cavern costs, is being further investigated.

6. Solar Energy

A large proportion — some say as much as 50% — of electricity generated in South Africa is converted to heat by consumers. Even in winter, most of the Republic, but in particular the Highveld of the Transvaal, enjoys many hours of sunshine. South Africa is becoming increasingly conscious that this "free" energy should be used to reduce electricity consumption for heating purposes. Because we, as electricity suppliers, are vitally involved, we should take the lead in the introduction of solar heaters in order to rationalize the use of electrical energy. The following steps should be given early consideration.

1. Promulgation of municipal by-laws specifying requirements for solar water heating, particularly where this will be supplemented by electric water heating. This would allow municipal electrical engineers to provide for this in their load and sytem planning.

2. Where a consumer supplements his solar water heating ith a booster element or use of electricity in any manner, the time of use and rating of the supplementary heater must be strictly controlled to avoid abnormally increasing the peak demand on overcast days. This can be achieved by load limiters or time switches, but the most satisfactory method is by a centrally operated ripple control installation.

The main danger is that if solar water heating is widely adopted, the revenue received from electrical water heating appliances used only a few times a year, may become insufficient to pay the associated demand and network costs. This problem could be solved, however, by network design which does not provide for electric water heating over peak.

As a matter of interest, the cost of using the sun for generating electricity, whether by means of photo-electric* cells or mirrors focussed on a steam raising boiler, at present exceeds R1 000 per kilowatt and is therefore not a practical proposition.

* R5 200 per kW — D. Hayes, Washington Post Outlook, February 1978.

7. Emergency Generating Plant

In theory, if individual consumers were encouraged to install their own emergency generating plant, and permitted to use them to reduce their individual demands, the system peak would be reduced and all consumers would benefit. In practice the following problems arise:

1. The plant is invariably driven by a petrol or diesel engine and the cost per kilowatt is many times that of a centrally situated gas turbine installation, using the same fuel and supplying the community.

2. Small plants do not receive adequate attention and maintenance, so that they frequently fail to start when required.

3. Tensy 'n bepaalde gedeelte van die verbruiker se las vir toevoer van sy eie generator afgesonder word, is daar 'n risiko van onbeheerde terugvoering na die leweringsliggaam se stelsel met die gepaardgaande gevare.

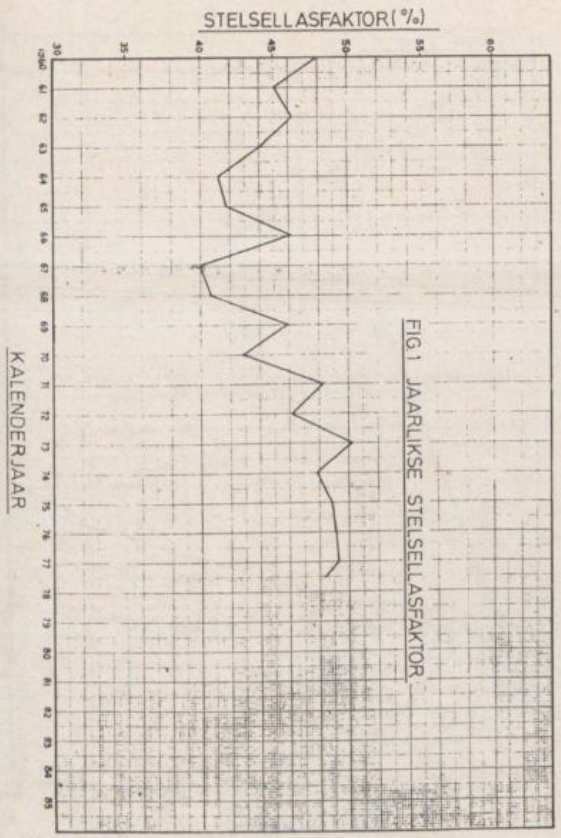
4. Die Leweringsliggaam beskik nòg oor die middele, nòg oor die gesag om die aanleg van 'n afstand af aan te skakel vir invoering in die stelsel tydens 'n stelselnoodtoestand.

Hoewel die Johannesburgse Brandweerverordeninge vereis dat daar 'n dieselaangedrewe generator in alle hoë geboue geïnstalleer moet word wat outomaties aangeskakel sal word wanneer die normale toevoer onderbreek word, word daar voorkeur geskenk aan 'n elektriese installasie in die gebou, sodat 'n tweede toevoer regstreeks van dié Afdeling se inlaatpunt geneem kan word en die normale toevoer behoorlik teen brandskade beskerm is. Met dié reëling word daar aangeneem dat die risiko van 'n eksterne kragonderbreking ten tyde van 'n brand gering is. Dit is dus die beleid om alle aansoeke om toestemming om noodgenerators in geboue te installeer, van die hand te wys tensy dit vir ander spesiale behoeftes noodsaaklik is, bv. hospitale, uitsaai-ondernemings, gekoppelde rekenaars, ens.

3. Unless a definite portion of the consumer's load is segregated for supply from his own generator, there is a risk of uncontrolled feedback into the Supply Authority's system, with its attendant dangers.

4. The Supply Authority has neither the means nor the authority to remotely start up the plant in order to feed into the system during a system emergency.

Although the Johannesburg Fire Protection By-laws require the installation in all high rise buildings of a diesel driven generator, which would start automatically in the event of failure of normal supply, preference is given to an electrical installation in the building, designed so that a second supply can be taken directly from this Department's point of entry and the normal supply is adequately protected against fire damage. It is accepted that with this arrangement, the risk of an external power failure occurring at the time of a fire is remote. It is the policy therefore to reject all applications for the installation of emergency generators in buildings, unless these are essential for other special needs, e.g. hospitals, broadcasting, on-line computers, etc.



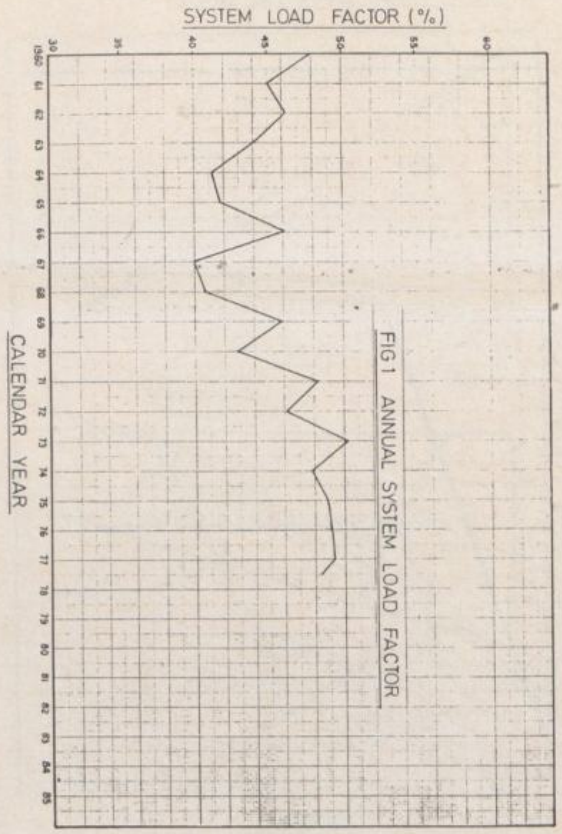


FIG. 2 LASDUURKROMME

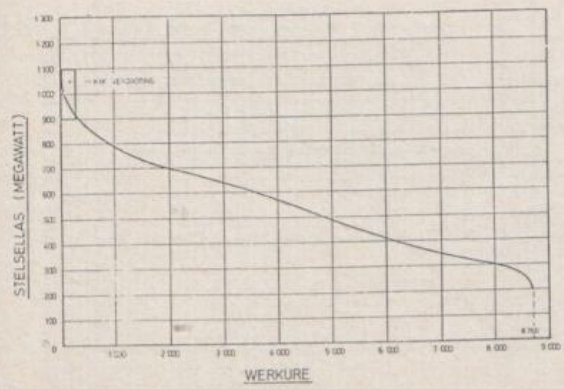
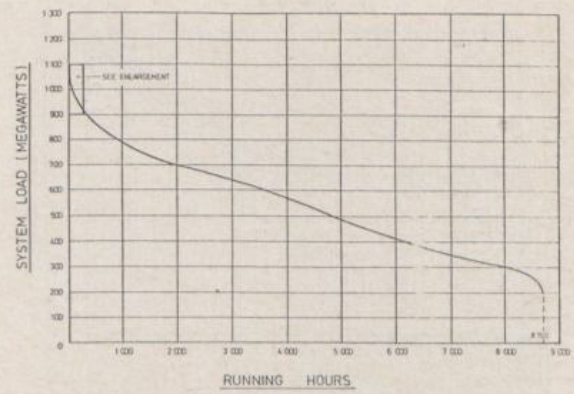
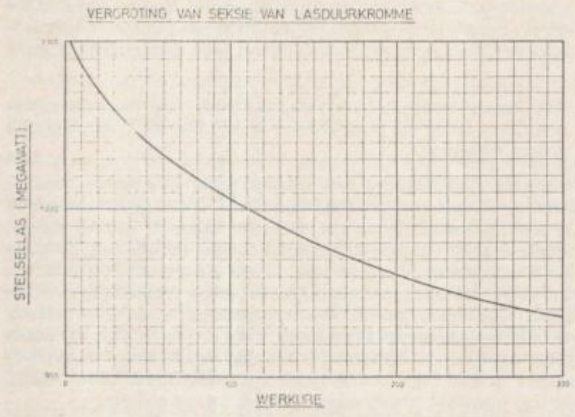


FIG. 2 LOAD DURATION CURVE





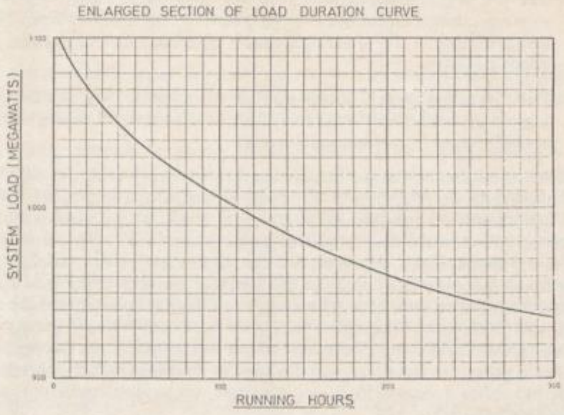


FIG. 3 TOTALE JAARLIKSE KOSTE

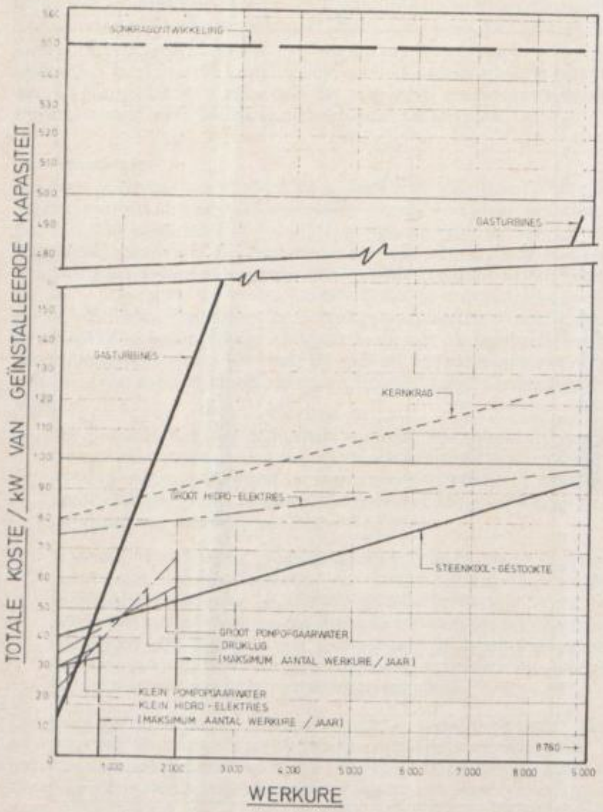


FIG. 3 TOTAL COST / ANNUM

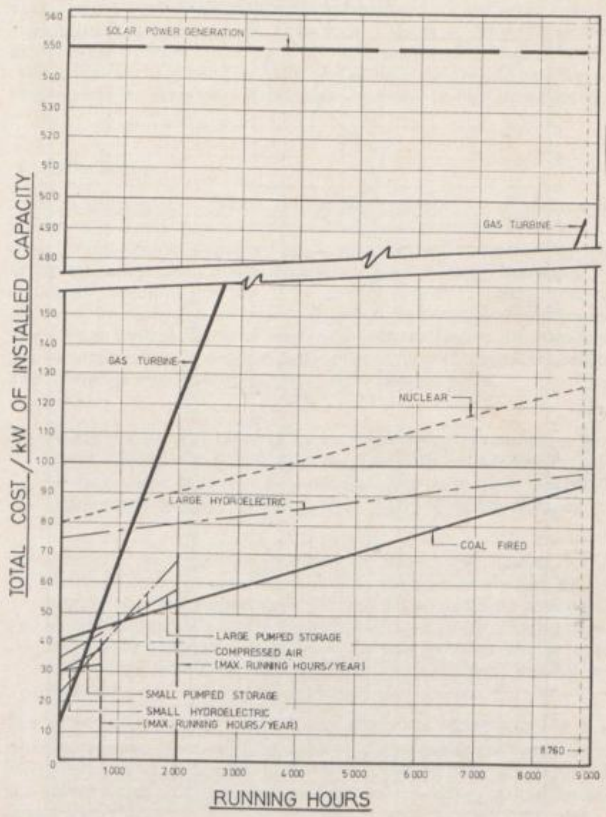


FIG 4 DAAGLIKSE LASKROMME

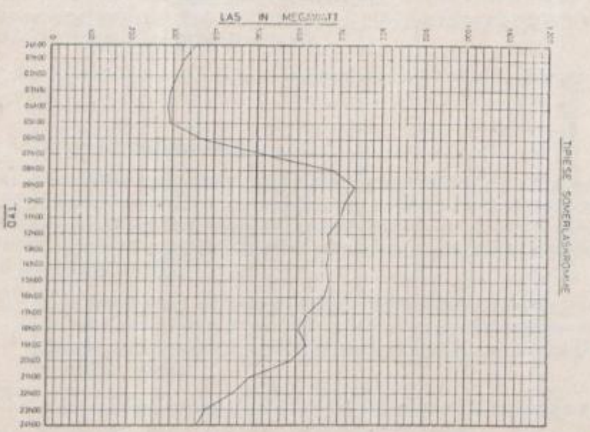
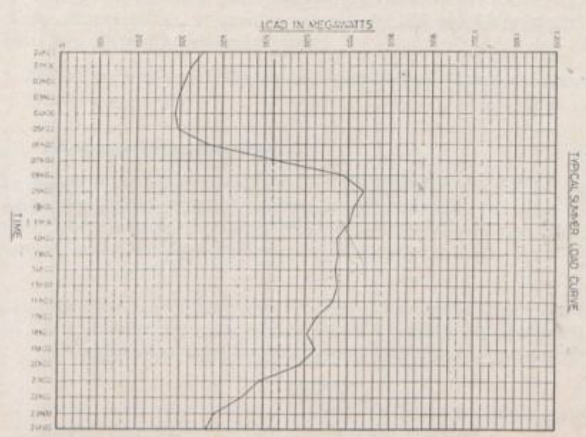
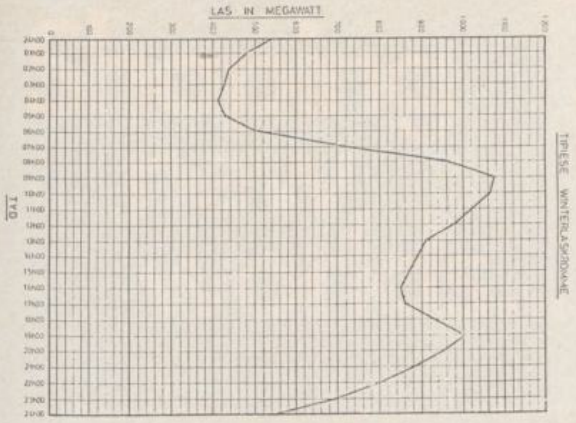
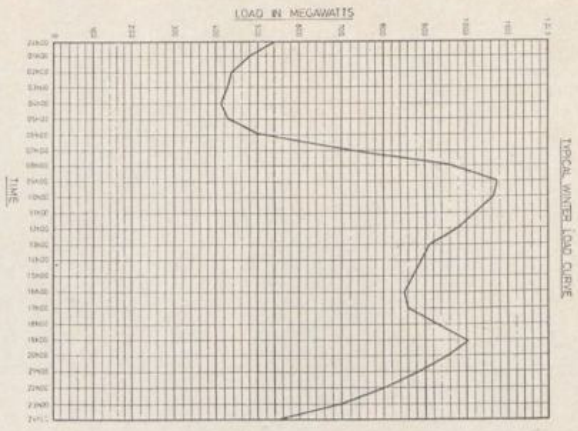


FIG 4 DAILY LOAD CURVE







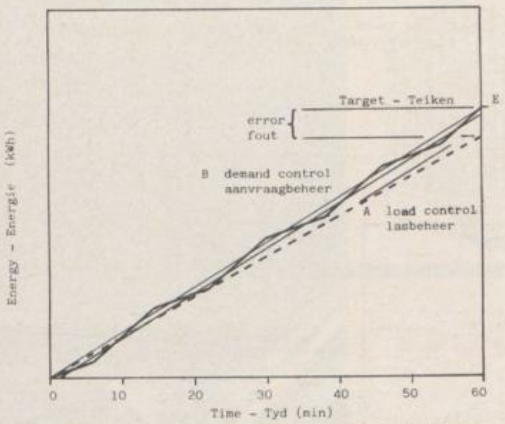


Fig. 8 ENERGY DIAGRAM SHOWING OPERATION OF CONTROLLERS
ENERGIEDIAGRAM MET WERKING VAN REELAAR

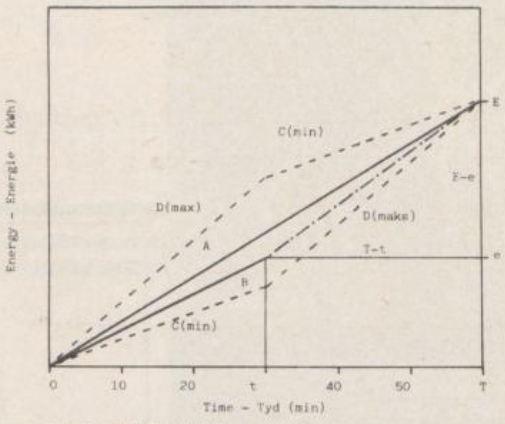


Fig. 7 ENERGY DIAGRAM
ENERGIEDIAGRAM

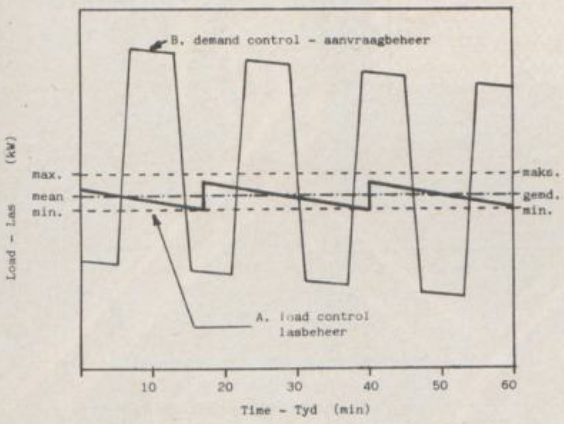


Fig. 9 LOAD CURVE SHOWING OPERATION OF CONTROLLERS
LASKROMME MET WERKING VAN REELAAR

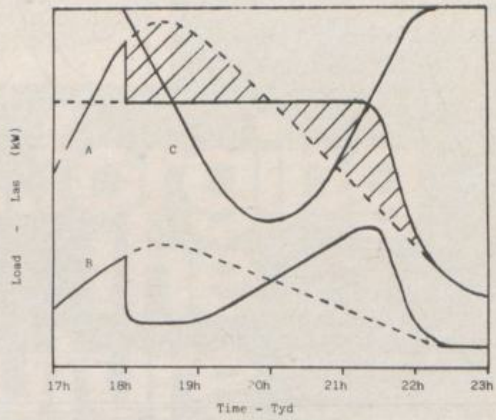


Fig. 3 LOAD CURVE WITH LOAD CONTROL
LASKROMME MET LASBEHEER

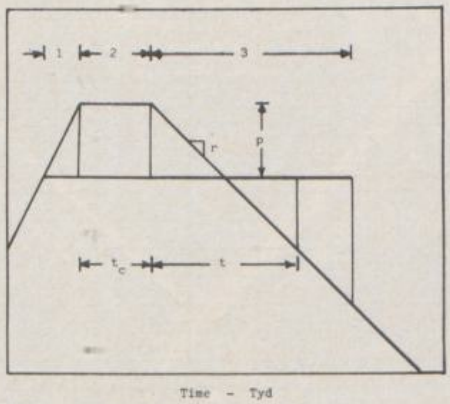


Fig. 4 SIMPLIFIED LOAD CURVE
VEREENVOUDIGDE LASKROMME

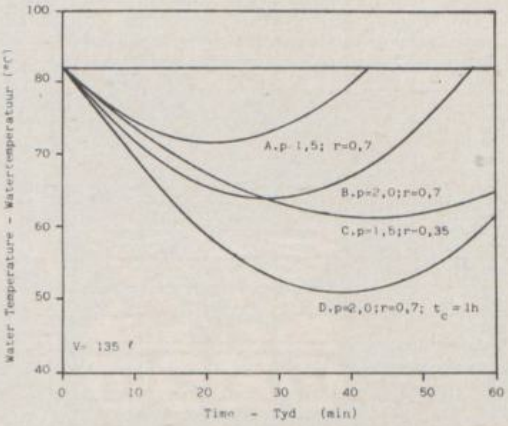


Fig. 5 VARIATION OF WATER TEMPERATURE
VERANDERING VAN WATERTEMPERATUUR

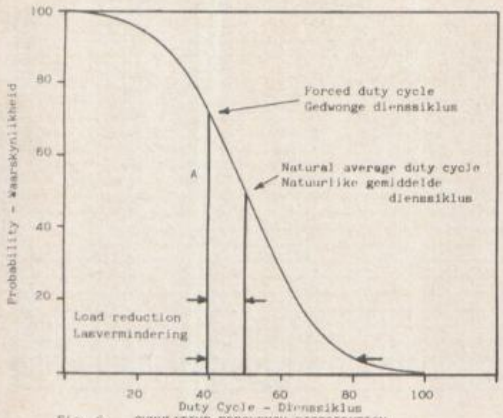


Fig. 6 CUMULATIVE FREQUENCY DISTRIBUTION
KUMULATIEWE FREKWENSIE VERSPREIDING

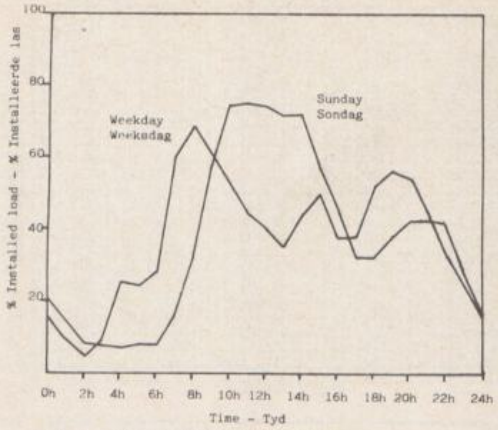


Fig. 1 AFTER DIVERSITY DEMAND CURVE
NADIVERSITEITSAANVRAAGKROMME

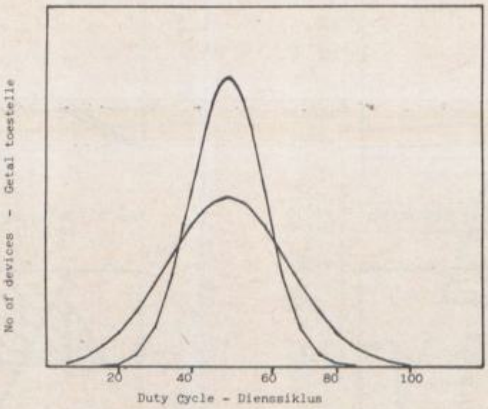


Fig. 2 FREQUENCY DISTRIBUTION OF DUTY CYCLE
FREKWENSIE VERSPREIDING VAN DIENSSIKLUS

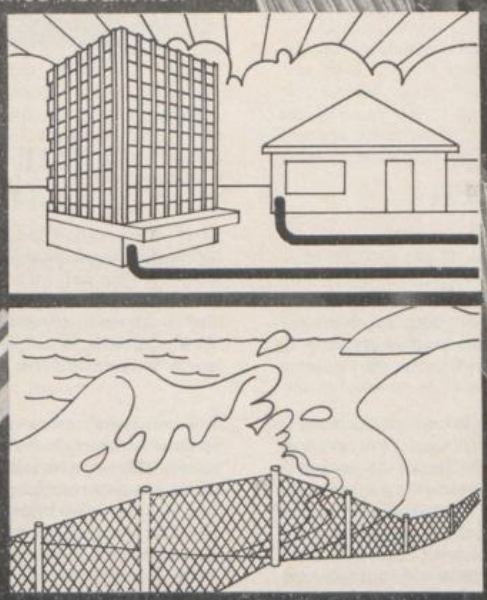
TABLE 1 : EMPIRICAL ACCUMULATED DEMAND SCHEDULE - PERCENT OF LOAD/
TABEL 1 : EMPIRIESE OPGELOPE AANVRAAG STAAT - PERSENT VAN LAS

TIME OFF (HOURS : MINUTES)/
ONDERBREKING (URE : MINUTE)

Time After Restoration (Hours : Minutes) Tyd Na Herstelling (Ure : Minute)	0:15	0:30	0:45	1:00	1:15	1:30	1:45	2:00	2:15	2:30	2:45	3:00	3:15	3:30	3:45	4:00
0:15	75,0	121,9	165,8	203,1	208,8	228,8	228,8	228,8	234,4	250,0	278,8	278,8	285,6	293,8	307,5	310,6
0:30	18,8	42,5	65,6	85,8	125,6	143,1	171,3	188,8	210,0	231,3	256,3	256,3	268,8	278,1	287,5	287,5
0:45	6,3	15,0	30,0	43,1	56,9	66,8	108,8	136,9	156,3	168,8	206,3	206,3	233,8	237,5	256,5	256,3
1:00		7,5	15,0	28,8	36,9	48,8	98,9	105,6	87,5	118,8	125,0	125,0	130,0	150,0	181,3	181,3
1:15		5,6	9,4	20,0	25,6	31,3	45,6	51,3	58,8	68,8	85,6	85,6	93,8	103,1	121,3	121,3
1:30			5,6	11,3	14,4	16,9	34,4	40,0	45,0	50,0	68,1	68,1	73,1	81,3	93,8	93,8
1:45				5,6	8,8	8,8	25,6	28,3	26,3	37,5	51,3	51,3	45,6	66,9	75,0	75,0
2:00					5,6	5,6	16,9	23,1	23,8	28,1	40,0	40,0	33,1	51,2	62,5	62,5
2:15							11,3	14,4	15,0	25,0	21,3	21,3	25,0	40,6	50,0	50,0
2:30							5,6	8,8	10,0	12,5	15,6	15,6	20,6	31,3	43,8	43,8
2:45								5,6	5,6	6,3	8,8	8,8	15,6	24,4	34,4	34,4
3:00										5,6	5,6	5,6	8,8	15,6	14,4	14,4
3:15													5,6	8,8	8,8	8,8
3:30														5,6	5,6	5,6

Shaping new worlds...

The white heat of USCO's mighty steel furnaces has spawned vibrant new industries to help the country of its birth grow stronger: to help its many peoples live better.



USCO low voltage (600/1000 V) PVC covered cables. (SABS 150/1970). Available as 1, 2, 3 or 4 core in 4, 6, 10 or 16 mm² conductor rated areas.

AluFence from ALCOR in nine heights: 0,6 to 3,0 m supplied in 30 and 50 m rolls to 50 mm mesh size and to a diameter choice of 2,3 2,8 and 3,1 mm. Alcor also produces rust-proof tie and straining wire *as well as barbed wire.*

...forging the future

Copper from Phalaborwa . . . converted from its molten state into electric cable . . . saving foreign currency . . . bringing electricity into our homes and industries.

Raw aluminium from Richards Bay . . . blended into special alloys, heat treated, drawn and woven into mesh fencing . . . fencing that never rusts.

USCO

ENQUIRIES:
P.O. BOX 48,
VEREENIGING, 1930,
TRANSVAAL, SOUTH AFRICA.
TELEPHONE: 4-5122.
TELEX: 8-7826.

USCO CABLE COMPANY AND USCO ALUMINIUM CORPORATION ARE MEMBER COMPANIES OF UNION STEEL CORPORATION (OF SOUTH AFRICA) LIMITED.

CURRICULUM VITAE

Mr Gerard Marloth graduated from the University of the Witwatersrand with a B.Sc. Degree in Electrical Engineering in 1959 and began his engineering career in the Chief Signals Engineer's Department of the South African Railways where he developed a special interest in centralised control systems.

He joined the Johannesburg City Council in 1968 and held the positions of Research and Development Engineer and System Test Engineer before being appointed to the position of System Engineer in 1975. Since that date he has been responsible for the management of the Department's System Division which consists of the operation of the Council's electricity supply system and the activities of supporting technical branches which include protection, telecommunications and metering.

Mr Gerard Marloth

DEEL II: DIE DINAMIKA VAN LASBEHEER

1. TER INLEIDING

Die eerste deel van dié referaat handel oor die algemene beginsels wat die gebruik van die hulpbronne wat vir 'n leweringsliggaam en die verbruiker beskikbaar is, beïnvloed. Hierdie gedeelte gaan dieper in op die oorwegings wat betrekking het op die beheer van een van dié hulpbronne, naamlik opgegaarde energie.

Die beheerde vrystelling van opgegaarde energie om ontwikkelaars te help om die wisselende las van 'n net te behartig, word alom toegepas. Die energie-opgaarstelsel dien as 'n soort buffer tussen die las met 'n wisselende aanvraag en 'n toevoerbron met 'n wisselende kapasiteit om daardie las te lewer. Die energie wat uit die opgaarstelsel vrygestel word, moet gewoonlik op 'n later tydstip uit die toevoernetwerk aangevul en uit die leweringsliggaam se standpunt maak dit uitgestelde energieverbruik uit. Soms is daar egter energiebronne soos fossielbrandstowwe, watervloei of sonkrag beskikbaar.

Energie kan weg van die las af opgegaar word as potensiële energie wat vir vervoer ná die las na elektriese energie omgeskep moet word. Die verskillende vorms van pompopgaarskemas wat in die eerste deel van dié referaat beskryf is, val in die kategorie. Dié skemas het die voordele van besparinge deur bestekvergroting en noukeurige beheer. Die transmissie- en distribusienet moet egter ontwerp wees om die spitsaanvraag van die las te kan dra.

Energie kan ook by die gebruikspunt opgegaar word as hitte-energie wat regstreeks gebruik kan word. Die bekendste hitteopgaartoestel is die huishoudelike warmwatertoestel, maar grootmaatwaterverwarming, opgaartoestelle vir ruimteverwarming en ondervloerse verwarming het ook groot hitteopgaarkapasiteit.

Hitte kan ook in 'n gebou-omgewing opgegaar word en huishoudelike lugreëlaars en stelsels vir verhitting, ventilering en lugreëling in geboue kan ook beheer word om spitslaste te verminder. Die vermindering van spitslaste bring mee dat daar op langtermyn besparings in die belegging in transmissie- en distribusietoerusting bewerkstellig kan word en dat dit aangewend kan word om 'n deel van die koste van die lasbeheertoerusting goed te maak.

Die opberging van energie by baie plekke weg van die beheerpunt vereis 'n beheerstelsel wat 'n groot aantal verwyderde punte sonder enige regstreekse terugvoering van informasie van die energiebehoeftes of energie wat by elke punt opgegaar is, kan beheer. Hoeveel daar noukeurige beheer van die netlas bewerkstellig kan word, is die beheer van afsonderlike laste nie noukeurig nie. Indien daar volle gebruik van die opgegaarde energie gemaak wil word, moet daar heelwat aandag aan die bepaling van die laskenmerke bestee word.

2. KENMERKE VAN LASTE MET ENERGIE-OPGARING

Opgaarenergie in die vorm van hitte impliseer die een of ander soort termostatiese beheer om die energie-invoer te beperk sodra die maksimum-werktemperatuur bereik is. Die nadiversiteitsaanvraag van 'n groep eenderse opgaartoestelle sal dus gewoonlik minder wees as die aanslag van die geïnstalleerde las en sal volgens die verbruik van opgegaarde energie wissel. Tipiese krommes van nadiversiteitsaanvraag vir

PART II: THE DYNAMICS OF LOAD CONTROL

1. INTRODUCTION

The first part of this paper dealt with the general principles affecting the use of the resources available to a supply authority and the consumer. This portion deals in greater detail with the considerations affecting the control of one of these resources, viz., stored energy.

The controlled release of stored energy in order to assist generating stations to meet the varying load on a network is widely used. The energy storage system acts as a buffer between a load with a verying demand and a source of supply with a varying capacity to supply that load. The energy released from the storage system must generally be made up from the supply network at a later stage and constitutes deferred energy consumption from the supply authority's point of view. In some cases, however, supplementary sources of energy such as fossil fuels, river flow or solar energy are available.

Energy can be stored at a point remote from the load as potential energy which must be converted to electrical energy for transportation to the load. The various forms of pumped storage schemes described in part one of this paper fall in this category. These schemes have the advantages of the economics of scale and a precise control. The transmission and distribution network must, however, be designed to carry the peak demand of the load.

Energy can also be stored at the point of use as heat energy which can be used directly. The best known heat storage device is the domestic water heater but considerable heat storage capacity may also exist in the form of bulk water heating, storage devices for space heating and underfloor heating. Heat can also be stored in a building environment and domestic air conditioners and building heating, ventilating and air conditioning systems can also be controlled to reduce peak loads. The reduction of peak loads implies that savings in investment in transmission and distribution equipment can be achieved in the long term and used to offset some of the cost of the load control equipment.

The storage of energy at many points remote from the point of control requires a control system capable of controlling a large number of remote points without any direct feedback of information of the energy requirements or energy stored at each point. Although precise control of the network load can be obtained, the control of individual loads is not precise and considerable effort must be given to determining the characteristics of the load using indirect measurements if full utilisation of the stored energy is to be obtained.

2. CHARACTERISTICS OF LOADS WITH ENERGY STORAGE

Energy storage in the form of heat implies some form of thermostatic control to limit the energy input once the maximum operating temperature has been reached. The after diversity demand of a group of similar storage devices will therefore usually be less than the rating of the installed load and will vary as the consumption of stored energy varies. Typical after diversity demand curves for domestic water heaters

huishoudelike warmwatertoestelle, uitgedruk as 'n persentasie van die geïnstalleerde las, word in Figuur 1 aangegee.

Die verhouding van nadiversiteitsaanvraag tot geïnstalleerde las verteenwoordig ook die gemiddelde dienssiklus of die deel van die tyd waarin die las as geheel aangeskakel is.

Die dienssiklus van 'n bepaalde las in die groep kan egter van die gemiddelde verskil en die frekwensieverspreiding van die dienssiklus van afsonderlike laste kan deur 'n kromme soos die kromme op in Figuur 2 aangedui word. Net soos die nadiversiteitsaanvraag of natuurlike dienssiklus gedurende die dag wissel, wissel die frekwensieverspreidings ook gedurende die dag. 'n Aansienlike hoeveelheid gegewens is dus nodig om 'n volledige beskrywing van die kenmerke van die soort las te verkry.

Die diversiteit van 'n aantal eenderse laste ontstaan as gevolg van die wisseling in energieverbruik sowel as die ongekoördineerde aan- en afskakeling van die beheertermostate. Die diversiteit kan geaffekteer word deur gebeurtenisse soos die einde van 'n gewilde televisieprogram of deur opsetlike ingryping om die energietoevoer te beheer. Enige versteuring veroorsaak 'n oorgangstoestand waar 'n gedeelte van die termostate gesinchroniseer word en die aanvraag tydelik toeneem. Die omvang en duur van die oorgangstoestand hang van die aard van die versteuring en die hoeveelheid uitgestelde energielewering af. Die uitwerking van die afskakeling van las vir 'n taamlike lang tyd kan gemeet word en in die vorm van Tabel 1 voorgestel word. Die boonste ry stel die bykomende las voor wat herstel is, uitgedruk as 'n persentasie van die normale aanvraag, en die volgende rye dui aan hoedat die las vermin-der namate die aanvraag weer normaal word.

Energie wat aan opgaartoestelle gelewer word, kan beheer word om die netlas te verminder deur 'n gedeelte van die opgaartoestelle af te skakel totdat die opgegaarde energie opgebruik is en dit dan met 'n tweede groep opgaartoestelle te vervang. Die nadeel van dié metode is dat daar 'n groter aantal toestelle in die tweede groep afgeskakel moet word om vir die verhoogde aanvraag van die eerste groep te vergoed, ens. 'n Alternatiewe metode is om die dienssiklus van die las te beheer en die energietoevoer só tot die verlangde waarde te beperk.

Die gebruik van 'n gedwonge of sintetiese dienssiklusbeheer maak 'n fyn beheer van die netlas moontlik deurdat die dienssiklus verander word om vir toenames of afnames van die oorblywende las van die net te vergoed. Op Figuur 3 word 'n tipiese laskromme (A) aangegee en die ooreenstemmende nadiversiteitsaanvraagkromme (B) wanneer die dienssiklus beheer is om die netlas konstant te hou. Die dele wat ingeskadu is, stel die energie voor wat gedurende die spitssnoeitydperk uitgestel word en die bykomende energie wat gedurende die herstellingstydperk gelewer word. 'n Derde kromme (C) gee die verandering in opgaarenergie weer.

Die aard van die opgaartoestel bepaal die frekwensie van die termostaat se werking. Die tydperk kan wissel van 'n paar minute vir lugreëlaars in vertrekke tot etlike ure vir grootmaatwaterverwarmers en dit bepaal die geskikste vorm van beheer. Wanneer baie groot laste beheer word, kan aanhoudende aan- en afskakeling ook onwenslik wees vanweë die flikkereffekte op die plaaslike distribusienet.

3. LASBEHEERPARAMETERS

Die bydrae wat energie-opgaartoestelle in die voorsiening van die spitsaanvraag op 'n net kan lewer, is nie net deur die aangeslane lewering of nadiversiteitsverbruik beperk nie, maar ook deur die energie-opgaarkapasiteit. Die energie wat deur die opgaarstelsel gelewer moet word, word bepaal deur die werktyd sowel as deur die waarde van die lasvermindering of die krag wat ontwikkel word.

Aangesien die absolute perk op die gebruik van lasvermindering of pompopgaarskemas gewoonlik die perke wat deur energie-oorwegings opgelê word, oorskry, moet die parameters wat die werkgrense bepaal, uitgewys word. Hoewel daar in die volgende gedeelte net van lasvermindering melding gemaak word, is dieselfde oorwegings op pompopgaarskemas van toepassing.

3.1 Werkgrense

Die gedeelte van die laskromme wat betrekking het op die spitstydperk waar lasvermindering en energieherstelling plaasvind, kan gewoonlik benader word deur 'n kort tydperk wanneer die las toeneem, 'n tydperk waartydens die las konstant is en 'n tydperk waar die las afneem, soos daar in Figuur 4 aangetoon word. Die eerste tydperk is gewoonlik onbeduidend ten opsigte van die uitgestelde energie terwyl die laaste tydperk die belangrikste is omdat dit bepaal hoe lank dit sal duur om al die uitgestelde energie te herstel.

As net die derde tydperk in aanmerking geneem word en daar aangeneem word dat die nadiversiteitsaanvraag konstant is, sal die opgegaarde energie wat op enige gegewe tyd in 'n toestel agterbly, soos volg wees:

expressed as a percentage of the installed load are shown in Figure 1.

The ratio of after diversity demand to installed load also represents the average duty cycle or the proportion of time that the load as a whole is switched on.

The duty cycle of a particular load in the group may differ from the average, however, and the frequency distribution of the duty cycle of individual loads can be represented by a curve shown in Figure 2. Just as the after diversity demand or natural duty cycle varies throughout the day, so the frequency distribution also varies during the day. A substantial amount of data is therefore necessary to obtain a complete description of the characteristics of this type of load.

The diversity between a number of similar loads results from the variation in energy consumption as well as the random switching of the controlling thermostats. This diversity can be dusturbed by events such as the end of a popular television programme or by deliberate intervention to control the supply of energy. Any disturbance results in a transient condition where a proportion of the thermostats become synchronised and a temporary increase in demand results. The magnitude and duration of this transient depends on the nature of the disturbance and the quantity of energy which has been deferred. The effects of disconnecting load for an extended period of time can be measured and represented in the form of Table 1. The top row represents the additional load which is restored expressed as a percentage of the normal demand, while the following rows show the reduction of this load as the demand returns to normal.

The control of energy supplied to storage devices in order to reduce network load can be accomplished on the basis of switching off a portion of the storage devices until the stored energy is exhausted and then substituting a second group of storage devices. The disadvantage of this approach is that in order to compensate for the increased demand of the first group, a larger number of devices must be switched off in the second group and so on. An alternative approach is to control the duty cycle of the load and so limit the supply of energy to the desired value.

The adoption of a forced or synthetic duty cycle control permits a fine control of the network load by making changes to the duty cycle to compensate for increases or decreases in the residual load of the network. Figure 3 shows a typical load curve, A, and the corresponding after diversity demand curve, B, when the duty cycle is controlled so as to keep the network load constant. The shaded areas represent the energy deferred during the peak lopping period and the additional energy supplied during the restoration period. A third curve, C, shows the change in stored energy.

The nature of the storage device determines the frequency with which the thermostat operates. The period can vary from a few minutes for room air conditioners to many hours for bulk storage heaters and determines the most suitable form of control. Where very large loads are being controlled, frequent switching may also be undesirable because of flicker effects on the local distribution network.

3. LOAD CONTROL PARAMETERS

The contribution which energy storage devices can make to meeting the peak demand on a network is not only limited by the rated output or the after diversity demand but also by the energy storage capacity. The energy which must be supplied by the storage system is determined by the operating time as well as the value of the load reduction or of the power generated. Since the absolute limit to the use of load reduction or pumped storage usually exceeds the limits imposed by energy considerations, it is necessary to identify the parameters which determine the operating limits. Although the following section only refers to load reduction, similar considerations apply to pumped storaged schemes.

3.1 Operating Limits

The portion of the load curve covering the peak period where load reduction and energy restoration takes place, can usually be approximated by a short period where the load rises, a period where the load is constant and a period where the load fails as shown in Figure 4. The first period is usually insignificant in terms of the energy deferred while the last period is the most significant because it determines the time taken to restore all the energy deferred.

If only the third portion is considered, and the after diversity demand is assumed to be constant, then the stored energy remaining in a storage device at any given time will be:

ELECTRICAL EQUIPMENT KIOSKS

FULL RANGE OF 30 MODELS
FOR HOUSING METERING, DISTRIBUTION, ELECTRONIC
AND OTHER EQUIPMENT

GOLNIX
ENGINEERS IN REINFORCED PLASTICS

GOLNIX
ENGINEERS IN REINFORCED PLASTICS

WE MARKET OUR PRODUCTS DIRECT
THROUGHOUT SOUTHERN AFRICA

CAPE OFFICE
95-2165
P.O. Box 2512
Cape Town 8000

TRANSVAAL
836-4593
P.O. Box 260092
Excom 2023

$$e = \frac{r}{2} t^2 - pt + E_s \qquad \text{Vgl. 1}$$

waar E_s = energie-opgaarkapasiteit per toestel (kwh).

r = veraderingstempo van las per toestel (kw/toestel/h).

p = lasvermindering per toestel by spits (kw/toestel).

t = verstrykte tyd (h).

Die parameter r hang van die kenmerke van die totale las sowel as die aantal toestelle wat beheer word, af. 'n Toename in die aantal toestelle bring 'n ooreenstemmende toename in die waarde van r mee.

Die opgaarenergie bereik 'n minimum ná 'n tyd p/r wanneer die uitgestelde energie gelyk is aan $p^2/2r$. Die werkgrens van die opgaartoestel, E_{min} bepaal die maksimum toelaatbare lasvermindering. Die waarde bepaal die maksimum toelaatbare lasvermindering. Die waarde word só bepaal:

$$E_{min} = E_s - \frac{p^2}{2r}$$

of

$$P_{maks} = \sqrt{(E_s - E_{min})\ 2r} \qquad \text{Vgl.2}$$

Die uitwerking van variasies in die waarde van p en r word deur krommes A, B en C in Figuur 5 geïllustreer. Dit toon die wisseling van temperatuur (opgaarenergie) in 'n 135 ℓ-warmwatertoestel met lasverminderings van 1,5 kw, 2,0 kw en 1,5 kw met 0,5 r. Die waardes van r wat vir dié krommes gebruik is, is 0,7 wat tipies is van 'n winteraandspits en 0,35 wat tipies van 'n oggendspits is.

Die uitgestelde energie gedurende die tweede gedeelte van die laskromme waar die totale las konstant is, staan in verhouding tot die tydsduur, t_c, van dié tydperk. Vergelyking 1 kan aangepas word om die konstante lastydperk in aanmerking te neem deur 'n konstante lastydperk in aanmerking te neem deur 'n konstante $E_c = pt_c$ af te trek.

Dan is $$e = \frac{r}{2} t^2 - pt + E_s - pt_c$$

en die duur van die lasafwerptydperk word van 2p/r na

$$t = \frac{p}{r} + \sqrt{(\frac{p}{r}) + \frac{2pt_c}{r} + t} \qquad \text{verleng.}$$

Die vierde kromme (D) in Figuur 5 stel die temperatuurwisseling voo as p = 2,0 kw 1 uur lank voordat die las teen die tempo van r verminder.

3.2 Verspreiding van natuurlike dienssiklus

As die las uit 'n groot aantal opgaartoestelle bestaan, moet daar vir variasies in die natuurlike dienssiklus van afsonderlike toestelle voorsiening gemaak word. Die waarskynlikheid dat 'n gegewe dienssiklus oorskry sal word, word voorgestel deur die soort kromme wat in Figuur 6 aangetoon word. As die lasbeheerstelsel 'n dienssiklus oplê wat met lyn A ooreenstem, sal al die toestelle wat met die gebied aan die regterkant van dié lyn ooreenstem, tot die totale lasvermindering bydra maar nie met gelyke bydraes nie. Die toestelle wat deur die gebied links van die lyn voorgestel word, sal nie tot die lasvermindering bydra nie, maar sal gaandeweg gesinchroniseer word met die lasbeheerrelê en sal bydra tot die oorgangstoestand.

Die verbruikers wat deur die ver regse gedeelte van die kromme voorgestel word, het 'n energieverbruik wat hoog is in verhouding tot die aanslag van hul verwarmer en die verhouding van opgaarenergieverbruik tot opgaarkapasiteit sal gewoonlik groot wees. Dié verbruikers sal gewoonlik die eerste wees om oor ontoereikende diens te kla aangesien die lasvermindering veel groter as die gemiddelde waarde is en die opgaarkapasiteit onvoldoende is. Pogings om dié paar verbruikers tegemoet te kom deur die lasvermindering te beperk, sal egter sulke groot stygings in aanvraagheffings meebring dat ander oplossings vir die probleem oorweeg moet word.

Die regstreekse oplossing vir die probleem lê in die uitbreiding van die opgaarkapasiteit om tred te hou met die energieverbruik. Dit word gewoonlik die verbruiker se verantwoordelikheid geag, maar een nutsdiens in Amerika onderneem om die koste van groter huishoudelike warmwatertoestelle te betaal. 'n Onregstreekse oplossing vir die probleem lê daarin dat verbruikers ooreenkomstig hul opgaarenergieverbruik gegroepeer word. In plaas daarvan dat daar 'n vaste dienssiklus ingestel word, plaas dié oplossing 'n eenderse lasvermindering op elke groep. Albei oplossings hang af van 'n betroubare metode om 'n egte waarde vir die verbruiker se opgaarenergieverbruik te bepaal. 'n Ander oplossing is om die verbruiker vry te stel van die lasbeheerstelsel en in plaas daarvan 'n vaste aanvraagheffing in te stel.

Vergelyking 1 word gegrond op die aanname dat die nadiversiteitsaan-

$$e = \frac{r}{2} t^2 - pt + E_s \qquad \text{Eqn. 1}$$

where E_s = energy storage capacity per device (kWh).

r = rate of change of load per device (kW/device/hour).

p = load reduction per device at peak (kW/device).

t = elapsed time (hours).

The parameter r depends on the characteristics of the total load as well as the number of storage devices which are controlled. An increase in the number of devices results in a corresponding decrease in the value of r.

The stored energy reaches a minimum after a time p/r when the energy deferred to equal to $p^2/2r$. The operating limit of the storage device, Emin, determines the maximum permissible load reduction. The value follows from:

$$E_{min} = E_s - \frac{p^2}{2r}$$

or

$$P_{max} = \sqrt{(E_s - E_{min})\ 2r} \qquad \text{Eqn.2}$$

The effect of variations in the value of p and r is illustrated by curves A. B. C in Figure 5 which show the variation of temperature (stored energy) in a 135 ℓ water heater with time for load reductions of 1,5 kW, 2,0 kW and 1,5 kW with 0,5 r. The values of r which have been used for these curves are 0,7 which is typical of a winter evening peak and 0,35 which is typical of a morning peak.

The energy deferred during the second portion of the load curve where the total load is constant, is proportional to the duration, t_c, of this period. Equation 1 can be modified to take the constant load period into account by subtracting a constant $E_c = pt_c$.

Then $$e = \frac{r}{2} t^2 - pt + E_s - pt_c$$

and the duration of the load shedding period is extended from 2p/r

to $$t = \frac{p}{r} + \sqrt{(\frac{p}{r}) + \frac{2pt_c}{r} + t}$$

The fourth curve, D, in figure 5 represents the variation of temperature when p = 2 kW for 1 hour before the load decreases at the rate r .

3.2 Distribution of Natural Duty Cycle

Where the load consists of a large number of storage devices, allowance must be made for variations in the atural duty cycle of individual devices. The probability of exceeding a given duty cycle is represented by a curve of the type shown in Figure 6. When the load control system imposes a duty cycle which corresponds to the line A, then all the devices which correspond to the area on the right of this line will contribute to the total reduction, but not by an equal amount. The devices represented by the area on the left on this line will not contribute to the load reduction but will eventually become synchronised with the load control relay and contribute to the switch on transient.

The consumers represented by the extreme right hand portion of the curve have an energy consumption which is high relative to the rating of their heater and will generally have a high ratio of stored energy consumption to storage capacity. These consumers will usually be the first to complain of inadequate service since the load reduction is much greater than the average value and the storage capacity is inadequate. Attempts to accommodate these few consumers by restricting the load reduction, however, will result in such large increases in demand charges that other solutions to the problem must be considered.

The direct solution to the problem consists of increasing the storage capacity to match the energy consumption. This is usually considered to be the responsibility of the consumer but one utility in America undertakes to pay the cost of increasing the size of domestic water heaters. An indirect solution to the problem consists of grouping consumers according to their stored consumption. Instead of imposing a fixed duty cycle, this solution imposes a similar load reduction on each group. Both solutions are dependent on a reliable method of establishing a genuine value for the consumer's stored energy consumption. Another solution is to grant the consumer exemption from the load control scheme and to levy a fixed demand charge instead.

Equation 1 is based on the assumption that the after diversity demand of

vraag van die opgaartoestelle konstant is en dat die energie wat vir elke toestel beskikbaar is, liniêr toeneem. As die nadiversiteitsaanvraag ooreenkomstig die totale las afneem, neem die beskikbare energie vinniger toe en die herstellingtyd sal verminder. Die uitwerking van 'n verspreiding van die dienssiklus rondom 'n gemiddelde kom ooreen met 'n deling van die beskikbare energie tussen 'n verminderde aantal laste na gelang al hoe meer laste hul natuurlike dienssiklus bereik. Die vermindering van die herstellingstyd is in dié geval net op laste met 'n baie hoë dienssiklus van toepassing.

4. AANTAL LASVERMINDERINGS

Die omvang van die lasvermindering en hoe dikwels dit nodig is, word bepaal deur die verskil tussen die potensiële aanvraag en die waarde van die maksimumaanvraag wat as 'n teikenwaarde gestel is. Hoe dikwels die teikenwaarde hersien word, word gewoonlik deur die grootmaattarief bepaal, maar bedryfsoorwegings kan veranderings meer dikwels nodig maak.

4.1 Lasvoorspellings

Terwyl die las in 'n net van uur tot uur en van maand tot maand op voorspelbare wyse varieer, varieer dit ook van dag tot dag op 'n minder voorspelbare wyse na gelang die weersomstandighede verander. Uiterse weersomstandighede kan abnormale hoë spitse tot gevolg hê of dit kan veroorsaak dat die las heelwat onder die verwagte peil bly.

Tesame met die maksimum lasvermindering wat werklik gedurende enige maand bewerkstellig word, moet daar ook rekening gehou word met hoe dikwels lasvermindering benodig word. Terwyl lasduurkrommes noodsaaklik is vir die berekening van energievereistes, kan die waarskynlikheid dat die las 'n gegewe waarde sal oorskry, die beste deur middel van 'n kumulatiewe frekwensieverspreiding van die daaglikse spits gedurende elke maand bepaal word. Die verwagte las kan meer as 95% van die spitswaarde op elke werkdag wees as die weersomstandighede gestadig is, maar gedurende ander maande kan die waarde tot 75% of minder daal.

Hoewel dit nie moeilik is om 'n teiken te stel nádat 'n spits voorgekom het nie, vind baie gebruikers dit frustrerend om die teiken 'n paar dae voor die einde van die afrekeningstydperk te moet verander terwyl die volle vermoë van die lasbeheerstelsel in die tussentyd gebruik is. 'n Goeie voorspellingstelsel is dus 'n noodsaaklike deel van 'n lasbeheerstelsel. Die voorspelstelsel moet die basiese lastoename, seisoens- en weerinvloede en korttermynlastendense kan identifiseer. Dit is nie net nodig om die waarskynlike spits vir elke maand tesame met die waarskynlike bestek te voorspel nie, maar ook om die teikenwaarde wat die maksimum lasvermindering met 'n minimum waarskynlikheid dat ongerief veroorsaak sal word, te voorspel. Gedurige hersiening van die teiken is nodig om vinnig te kan reageer op tendense wat anders op 'n later tydstip 'n hersiening kan afdwing.

'n Voorspellingstelsel maak op goeie invoerdata staat om goeie voorspellings te kan lewer. Die oorheersende kenmerk van 'n lasbeheerstelsel is dat dit juis daardie gegewens wat vir voorspelling nodig is, onbetroubaar maak deurdat die spits na die een of ander arbitrêre waarde wat vir die teiken geselekteer is, verminder word. Die waarde van die potensiële spitsaanvraag moet dus bereken word uit die verskil tussen die verwagte nadiversiteitsaanvraagkromme en die dienssiklus wat deur die lasbeheerstelsel opgelê is. Die nadiversiteitsaanvraagkromme kan gemonitor word deur die lasvermindering aan te teken wanneer elke lasblok die eerste keer afgeskakel word, en as die herstellingskenmerke bekend is, kan verdere waardes ook op daaropvolgende geleenthede van die lasvermindering bereken word. Noukeuriger waardes kan verkry word deur 'n verteenwoordigende lasblok wat nie by die lasbeheerproses inbegrepe is nie, te kontroleer.

Aangesien korttermynfluktuering in die netlas 'n geraas verteenwoordig wat oor enige aflesing gelê word, is daar 'n groot aantal metinge vir 'n noukeurige en betroubare resultaat nodig. Datavaslegging per hand en die verwerking daarná kan baie vervelig wees en klaarblyklik is daar 'n behoefte aan 'n outomatiese datavasleggingstelsel wat data kan opteken in 'n vorm wat geskik is vir latere verwerking deur 'n klein rekenaar. Dit word reeds gedoen in gevalle waar die lasbeheerstelsel op 'n mini-rekenaar gebaseer is, en dit is te verwagte dat mikroverwerkingsreëlaars binnekort dié vermoë as opsioneel sal aanbied.

4.2. Bedryfsoorwegings

Waar lasbeheerstelsels gewoonlik op die vermindering van aanvraagheffings ingestel is, kan lasbeheer op dele van die distribusiestelsel groot besparings in die vorm van uitgestelde besteding teweegbring. Dit mag gedurige lasvermindering in dele van die net gedurende 'n gedeelte van die jaar vereis al is die totale las ook onder die teikensyfer.

Die posisie is effens anders vir 'n onderneming wat sy eie ontwikkelingshulpbronne het. Elke hulpbron word 'n posisie op 'n verdienste-skaal toegewys en bykomende hulpbronne word in daardie volgorde

the storage devices is constant and that the energy available to each device increases linearly. If the after diversity demand decreases in sympathy with the total load, then the energy available increases more rapidly and the time to restore will be reduced. The effect of a distribution of the duty cycle about the mean is similar with the available energy being shared between a decreasing number of loads as more and more loads reach their natural duty cycle. The reduction of the restoration time in this case only applies to those loads with a very high duty cycle.

4. FREQUENCY OF OPERATION

The extent and frequency of load reduction is determined by the difference between the potential demand and the value of maximum demand set as a target value. The frequency with which the target value is revised is usually determined by the bulk supply tariff but more frequent revisions can be necessitated by operating considerations.

4.1 Load Forecasts

While the load in a network varies from hour to hour and month to month in a predictable manner, it also varies from day to day in a less predictable manner as the weather changes. Extreme weather conditions can give rise to abnormally high peaks or cause the load to remain well below the expected value.

The maximum load reduction which is actually achieved in any month must also be considered in conjunction with the frequency with which load reduction is required. While load duration curves are essential for estimating energy requirements, the probability of the load exceeding a given value is best given by a cumulative frequency distribution o the daily peaks in each month. The expected load can be above 95% of the peak value on every working day if weather conditions are stable but in other months this value may drop to 75% or less.

While there is no difficulty in setting a target once a peak has occurred, many users have experienced the frustration of having to revise the target a few days before the end of the accounting period after having used the full capability of the load control system for the intervening period. A sound forecasting system is therefore an essential part of a load control system. The forecasting system must be able to identify basic load growth, seasonal and weather influences and short term load trends. Apart from forecasting the probable peak for each month together with the probable range, it is also necessary to forecast a target value which will yield the maximum load reduction with a minimum probability of causing inconvenience. Frequent revision of the target is necessary in order to respond quickly to trends which could otherwise force a revision at a later date.

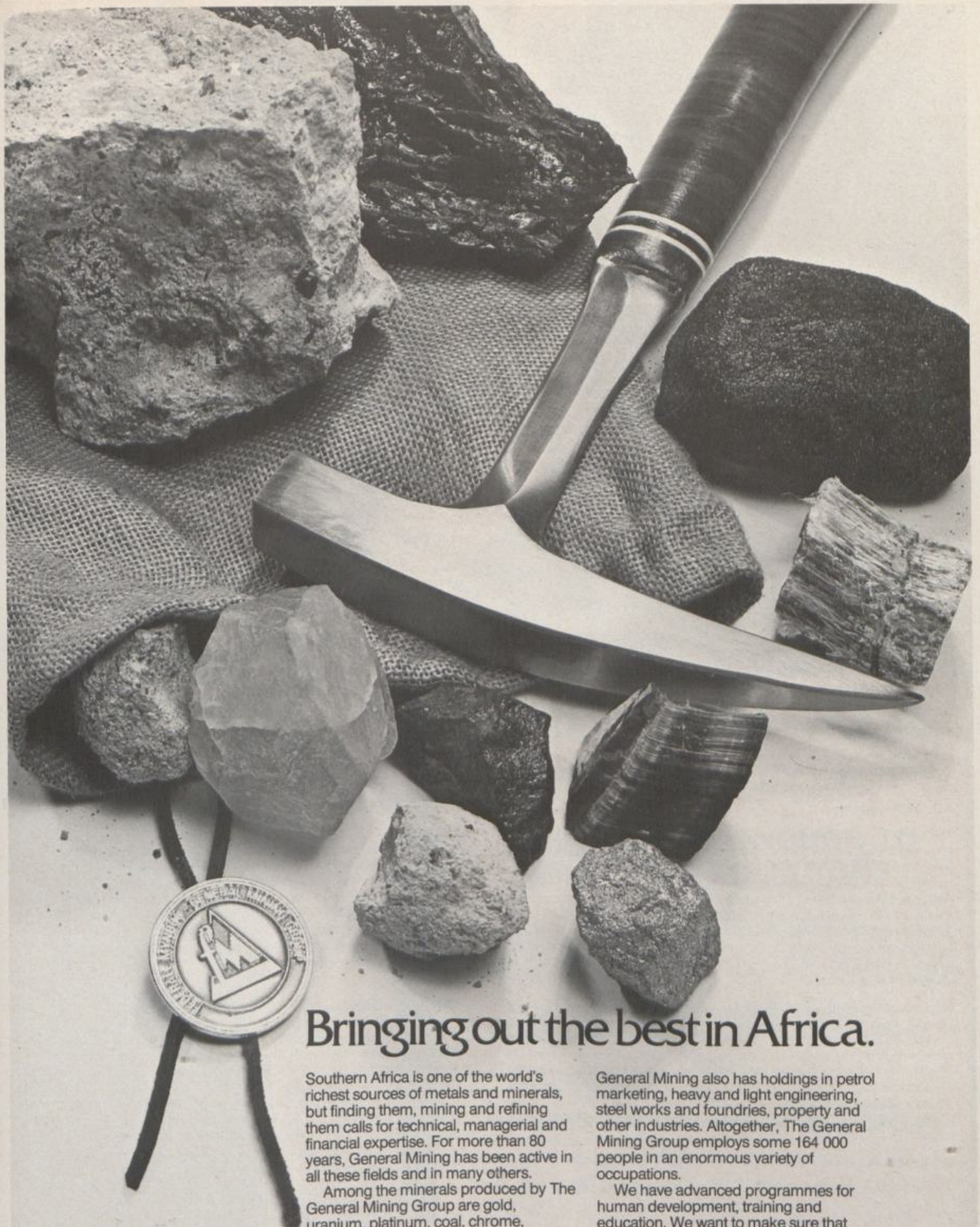
A forecasting system depends on sound input data in order to provide good forecasts. The dominant feature of a load control system is that it corrupts the very data that is required for forecasting by lowering the peak to some arbitrary value which has been selected for the target. The value of the potential peak demand must therefore be estimated from the difference between the expected after diversity demand curve and the duty cycle imposed by the load control system. The after diversity demand curve can be monitored by recording the load reduction when each group is switched off for the first time and if the recovery characteristics are known, then further values can be calculated from the load reduction on subsequent occasions as well. More accurate values can be obtained by sampling a representative group which has been excluded from the load control process.

Since short term fluctuations in the network load represent a noise that is superimposed on any reading, a large number of readings are required for an accurate and reliable result. Manual data capture and subsequent processing can be very tedious and it is evident that a need exists for an automatic data logging system which can record data in a form suitable for later processing by a small computer. This is already done where the load control system is based on a mini computer and it might be expected that micro processor controllers will offer this feature as an option in the near future.

4.2 Operating Considerations

While load control systems are usually orientated towards the reduction of demand charges, control of the load on parts of the distribution system can result in large savings in the form of deferred expenditure. This might call for frequent load reduction in parts of the network for a portion of the year even though the total load is below the target figure.

The position is somewhat different for an undertaking which has its own generation resources. Each resource is allocated a position on a merit scale and additional resources are utilised in this order. Load control



Bringing out the best in Africa.

Southern Africa is one of the world's richest sources of metals and minerals, but finding them, mining and refining them calls for technical, managerial and financial expertise. For more than 80 years, General Mining has been active in all these fields and in many others.

Among the minerals produced by The General Mining Group are gold, uranium, platinum, coal, chrome, asbestos, fluorspar, copper, ferro-chrome, ferro-manganese and electrolytic manganese. In the industrial sphere, the Group is a producer of concrete, asbestos cement and steel piping and rail rolling stock.

General Mining also has holdings in petrol marketing, heavy and light engineering, steel works and foundries, property and other industries. Altogether, The General Mining Group employs some 164 000 people in an enormous variety of occupations.

We have advanced programmes for human development, training and education. We want to make sure that the people who work for us get the most out of it. General Mining is not just in Southern Africa to stay, we're here to grow. And our people are growing with us.

THE GENERAL MINING GROUP.

9650

aangewend. Lasbeheer neem gewoonlik 'n posisie tussen die basislas en die spitslasstasies in en word net gebruik wanneer die kapasiteit van die basislasstasies ontoereikend is.

Die werking van die basislasstasies kan egter geoptimaliseer word deur die gebruik van die lasbeheerstelsel om snelle veranderings in die las te matig. Die lasbeheerstelsel beheer nog die spitsaanvraag wat in die net ingevoer word, maar dié aanvraag kan buite die spitstyd voorkom as die toenametempo van ontwikkelde krag opsetlik laer gehou word as dié van die totale las. Die ontwikkeling kan eweneens verminder word voordat die las begin afneem. As dit op dié manier gebruik word, kan daar van die lasbeheerstelsel vereis word om elke dag van die jaar ewe veel te werk en effektiewe werking is dus noodsaaklik.

'n Lasbeheerstelsel bring ook besparing in die bedryfskoste van kragsentrales teweeg deurdat daar minder of geen spinreserwe nodig is. Dit vergemaklik ook die instandhouding en nasien van die aanleg. Aangesien die dienssiklus van die beheerde las selde onder 30% van die nadiversiteitsaanvraag daal, is die res beskikbaar vir afwerping in noodgevalle. Dié vermoë om gelyktydig lasvermindering en spinreserwe te verskaf, onderskei lasbeheerstelsels van alle ander vorms van spitsbesnoeiing.

Nog 'n aanwending van dié noodvermoë is outomatiese lasafwerping wanneer die toevoerfrekwensie onder 'n voorafbepaalde peil daal. Aangesien dit geen korttermynongerief veroorsaak nie, kan die klinkpunt op 'n frekwensie gestel word wat hoër is as die voerders se klinkpunt. As alle lasbeheerrelês in minder as tien sekondes in werking gestel kan word, sal toevoeronderbrekings slegs in uiterste gevalle nodig wees.

5. BEHEERSTRATEGIEË

5.1 Bedryfsvereistes

Die werking van 'n lasbeheerstelsel behels gewoonlik meer as slegs die afskakel van 'n aantal opgaartoestelle gedurende elke spitstyd sonder inagneming van die werklike las, en dit is van die een of ander vorm van toelusbeheer afhanklik om doeltreffende gebruik van toevoerbronne te kan maak.

Die algemene vereistes vir 'n ideale reëlaar is die volgende:

(a) Die beskikbare energie moet ten volle benut word.

(b) Die lasvermindering moet gelyk onder al die verbruikers verdeel word.

(c) Die aantal transmissies moet tot 'n minimum beperk word as die lasbeheertoerusting nie vir voortdurende werking aangeslaan is nie.

5.2 Aanvraagbeheer

Die beheerveranderlike is gewoonlik die maksimum aanvraag wat by 'n grootmaattoevoerpunt geneem word of die las op 'n substasie. As die beheerveranderlike die las op substasie is, of as die maksimum aanvraag met 'n termiese aanvraagmotor gemeet word, is daar 'n reëlaar nodig wat die oombliklike krag beperk, en moet die beheerde las in 'n aantal klein lasblokke verdeel word. As die beheerveranderlike die geïntegreerde waarde van die las is met 'n integrasietydperk van 30 minute of een uur, is daar 'n paar beheerstrategieë beskikbaar. Hoe dié strategieë werk, kan die beste begryp word deur raadpleging van 'n energiediagram soos op Figuur 7.

Die energiediagram stel die geïntegreerde waarde van die las op enige tyd gedurende die meettydperk voor. As die las noukeurig op die teikenwaarde gehandhaaf word, stel lyn A die gevolg voor en dit word as 'n verwysingslyn gebruik. Die helling van A stel die oombliklike krag voor wat deur 'n las gebruik word wat gelyk staan aan die teikenwaarde. Dis nie altyd moontlik om die las op die teikenwaarde te handhaaf nie, en as die gemiddelde waarde van die las deur lyn B voorgestel word, sal die oorblywende tyd ná 'n rukkie T-t wees en die beskikbare energie sal E-e wees.

Die krag wat nou gedurende die oorblywende tydperk getrek kan word, is

$$p = \frac{E - e}{T - t} \qquad \text{Vgl. 3}$$

Die reëlaar se hooftaak is om te sorg dat die fout tussen die werklike geïntegreerde waarde en die teikenmaksimumaanvraag altyd so klein as moontlik gehou word terwyl die lasbeheerstelsel in werking is. Die reëlaar moet egter binne die grense bly wat ooreenstem met die oorblywende las nadat die hele las afgewerp is en die maksimumlas wanneer alle laste herstel is. Die boonste grens kan egter deur ander faktore bepaal word, byvoorbeeld deur transformator- of kabelaanslae. Die stippellyne C en D stel tipiese maksimum- en minimumgrense voor. Dié lyne word van die eindpunte af getrek om die reëlaar se werkgebied te definieer.

generally occupies a position between the base load and the peaking stations and would only be used when the capacity of the base load stations was insufficient. The operation of the base load stations can, however, be optimised by using the load control system to moderate rapid changes in load. While the load control system still controls the peak demand imported into the network, this demand can occur outside of peak hours if the rate of increase of generated power is deliberately made less than that of the total load. In the same way, generation can be reduced before the load starts to fall. When used in this way, the load control system can be required to operate to a similar extent on every day of the year and effective operation is essential.

A load control system also produces saving in power station running costs by reducing the amount of spinning reserve required or eliminating it altogether. This also facilitates the maintenance and overhaul of plant. Since the duty cycle of the controlled load rarely falls below 30% of the after diversity demand, the balance is available for shedding in emergencies. This ability to provide peak lopping and spinning reserve simultaneously distinguishes load control systems from all other forms of peak lopping.

A further application of this emergency capability is automatic load shedding when the supply frequency falls below a predetermined level. Since no short term inconvenience results, the trip point can be set to a frequency which is above the trip point for feeders. If all load control relays can be operated in less than 10 seconds, then supply interruptions will only be necessary in the most extreme cases.

5. CONTROL STRATEGIES

5.1 Operational Requirements

The operation of a load control system usually goes beyond switching a number of storage devices off over every peak without regard to the actual load and depends on some form of closed loop control to make effective use of the supply resources.

The general requirements for an ideal controller are:

(a) The available energy must be fully utilised.
(b) The load reduction must be shared equally between all consumers.
(c) The number of transmissions must be kept to a minimum if the load control equipment is not rated for continuous operation.

5.2 Demand Control

The control variable is usually the maximum demand taken at a bulk supply point or the load on a substation. If the control variable is the load on a substation or the maximum demand is measured by a thermal demand meter, then a controller which limits the instantaneous load is required and the controlled load should be divided into a number of small blocks of load. If the control variable is the integrated value of the load with an integrating period of 30 minutes or 1 hour, then a number of control strategies are available. The operation of these strategies is best understood by reference to an energy diagram as shown in Figure 7.

The energy diagram represents the integrated value of the load at any time during the metering period. If the load is accurately maintained at the target value then line A results and this is used as a reference line. The slope of A represents the instantaneous power taken by a load which is equal to the target value. It is not always possible to maintain the load at the target value and if the average value of the load is represented by the line B, then after some time has elapsed, the time remaining will be T — t and the available energy will be E — e. The power which can now be drawn for the remainder of the period will be:

$$P = \frac{E - e}{T - t} \qquad \text{Eqn. 3}$$

The main task of the controller is to ensure that the error between the actual integrated value and the target maximum demand is always kept as small as possible while the load control system is in operation. The controller must, however, operate between the limits corresponding to the residual load after all load has been shed and the maximum load when all loads are restored. The upper limit may, however, be determined by some other consideration such as transformer or cable ratings. The dotted lines C and D represent typical maximum and minimum limits. These lines have been drawn from the end points in order to define the operating area of the controller.

ONLY ONE FUEL

CAN BEAT THE ENERGY CRISIS . . .

AND WE HAVE ENOUGH TO LAST YOU GENERATIONS!

Contact the T.C.O.A. for FREE Technical advice and assistance for all your steam combustion and plant enquiries. Our Laboratory and Technical experts will prove to you that

COAL IS YOUR GUARANTEE OF –
LOW-COST ENERGY 365 DAYS A YEAR

Find out everything about coal.
Phone or write to:

THE TRANSVAAL COAL OWNERS ASSOCIATION (1923) (PTY) LTD.

P.O. Box 62361 Marshalltown, 2107 Johannesburg, Telephone: 833-6200
and

NATAL ASSOCIATED COLLIERIES (PTY) LTD.
P.O. Box 952 Durban 4000, Telephone: 323651

Reëlaars kan geklassifiseer word as proporsionele, integrerende, gekombineerde of rekenaarreëlaars. 'n Proporsionele reëlaar het gewoonlik twee instellingspunte. Dit werp las af wanneer die maksimumstelpunt oorskry word en herstel las wanneer die totale las onder die minimumstelpunt daal. Die verskil tussen die instelpunte moet groter wees as die maksimumlas wat te enige tyd herstel kan word. Dit is ook gebruiklik om 'n filter aan die invoer aan te bring ten einde die kortter-mynfluktuerings in die sein wat die netlas verteenwoordig, uit te skakel. Dié soort reëlaar is geskik vir stelsels waar termiese maksimumaanvraagmeters gebruik word of waar die las beperk moet word. Dit voldoen egter nie aan al die vereistes vir 'n ideale reëlaar nie want dit kan al die beskikbare energie benut terwyl die las toeneem of afneem.

In Figuur 8 word daar geïllustreer hoe 'n proporsionele reëlaar werk. Kromme A is tipies van die tydperk waartydens die las afneem. Aangesien die maksimumlas tot die verwysingswaarde beperk is, kan die integraal van die werklike las nooit die verwysingslyn nader nie en kan op die beste ewewydig aan die verwysingslyn loop.

As die las in ses groepe verdeel word, sal die verskil tussen die maksimum en minimumstelpunte gelyk staan aan een sesde van die totale geïnstalleerde las plus 'n 10%-veiligheidsgrens of 18% van die geïnstalleerde las. In Figuur 9 word aangetoon hoedat die gemiddelde waarde van die las amper gelyk kan wees aan die teikenfiguur terwyl die las bestendig is, maar dat dit gelyk sal wees aan die gemiddeld van die maksimum- en minimumstelpunte sodra die las begin afneem. Die lasintegraal sal selfs kleiner wees wanneer party van die termostate nog afgeskakel is en die herstelde las minder as die geïnstalleerde las is. Die fout sal minstens 9% van die geïnstalleerde opgaarverwarmingslas wees wat beduidend is in vergelyking met 'n tipiese lasvermindering van 30%.

'n Integrerende reëlaar het gewoonlik net een instelpunt, naamlik die teikenaanvraag. Dit werp las af wanneer die lasintegraal bo die verwysingslyn styg en herstel las wanneer die lasintegraal onder die verwysingslyn daal. 'n Dooieband is nodig om vinnige skommelinge rondom die verwysingslyn te vermy. Die invoersein bestaan gewoonlik uit pulse wat van die metertoerusting afkomstig is en filtrering is dan nie nodig nie. Dié reëlaar voldoen ook nie aan al die vereistes vir 'n ideale reëlaar nie want dit maak op die lasskommeling rondom die teikenwaarde staat en vereis 'n betreklike groot aantal transmissies.

In Figuur 8 word daar met kromme B geïllustreer hoe 'n integrerende reëlaar werk. Die verbyskiet hang van die reaksietyd van die lasbeheerstelsel af en die reëlaar sal aanhou om las af te werp of te herstel totdat die lasintegraal weer oor die verwysingslyn beweeg. As 'n enkelbeheerkontak met histerese gebruik word, hou die aksie aan totdat die lasintegraal oor die dooieband beweeg het. Die oormatige afskakeling en herstelling van las laat die totale las baie swaai soos daar in Figuur 9 aangedui word, en dit kan heeltemal onaanvaarbaar wees. Dié soort reëlaar is slegs doeltreffend met lasbeheertoerusting met 'n baie snelle reaksie en selfs dan is bykomende beheerlogika en tydvertragings wenslik ten einde die skommeling tot 'n minimum te beperk.

Een variasie van dié reëlaar wat bedoel is vir toerusting wat dikwels afgeskakel kan word, herstel las ná 'n tydvertraging. Die stelsel is gereël om al die laste af te tas en elke tydvertraging weer aan die gang te sit net voordat die tydvertraging verstryk. Die integrerende reëlaar word gebruik om die siklus te beëindig of aan die gang te sit wanneer die lasintegraal oor die verwysingslyn van die reëlaar beweeg. Die lasbewegings wat deur die stelsel veroorsaak word, is betreklik klein mits die integrerende reëlaar se dooieband smal is.

Die kombinasie van 'n proporsionele en 'n integrerende reëlaar bied 'n oplossing vir party van die probleme wat in die vorige paragrawe beskryf word. Enigeen van die twee kan as die meesterreëlaar dien en die ander een dan as die hulpreëlaar. 'n Proporsionele reëlaar kan as 'n hulpreëlaar gebruik word om die maksimumlasafwykings wat veroorsaak word deur die skommelinge inherent aan die integrerende reëlaar, te beperk. Daar kan groter noukeurigheid met die reëling bewerkstellig word as met 'n integrerende reëlaar alleen, en dit veroorsaak minder transmissies. Die dooieband van 'n elektromeganiese integrerende analoogreëlaar is egter te groot vir bevredigende resultate. 'n Syferreëlaar met afsonderlike styg- en daaluitvoere en 'n klein, duidelik afgebakende dooieband vir 'n snelle reaksie sou veel bevredigender wees.

'n Integrerende reëlaar kan as 'n hulpreëlaar gebruik word om die regte instelpunte vir 'n proporsionele reëlaar te bepaal en sodoende te sorg dat die bestendige las nie die teiken oorskry nie, maar dat die gemiddelde waarde van 'n afnemende las gelyk is aan die teiken. Weer eens is 'n redelike snelle reaksie by die integrerende reëlaar vir noukeurige beheer nodig. 'n Eksperimentele installasie wat gebruik maak van 'n elektromeganiese integrerende reëlaar wat verander is om die dooieband kleiner te maak, en 'n proporsionele reëlaar waarin die beweging omgetak is om die instelpunte in verhouding tot die laswyser te verskuif, het bewys dat die verhoogde noukeurigheid wat dit meebring, 'n groter lasvermindering moontlik maak sonder om die waarde van die energie wat uitgestel word, te vermeerder.

Controllers can be classified as proportional, integrating, combined or computing controllers. A proportional controller usually has two set points and sheds load when the maximum set point is exceeded and restores load when the total load falls below the minimum set point. The difference between the set points must be greater than the maximum load which can be restored at any time. It is also usual to add a low pass filter to the input in order to eliminate the short term fluctuations in the signal representing the system load. This type of controller is suitable for systems where thermal maximum demand meters are used or load limiting is required. It does not meet all the requirements of an ideal controller, however, because it cannot utilize all the available energy while the load is rising or falling.

The operation of a proportional controller is illustrated in Figure 8 where curve A is typical of the period when the load is falling. Since the maximum load is limited to the reference value, the integral of the actual load can never approach the reference line and can at best be parallel to the reference line.

If the load is divided into 6 groups then the difference between the maximum and minimum set points will be equal to one sixth of the total installed load plus a 10% safety margin or 18% of the installed load. Figure 9 shows how the average value of the load can be nearly equal to the target figure while the load is steady, but will be equal to the mean of the maximum and minimum set points once the load starts to fall. The load integral will be even lower if some of the thermostats are still switched off and the restored load is less than the installed load. The error will be at least 9% of the installed storage heating load which is significant when compared with a typical load reduction of 30%.

An integrating controller usually has only one set point which is the target demand and sheds load when the load integral is above the reference line and restores load when the load integral is below the reference line. A dead band is necessary in order to avoid rapid hunting about the reference line. The input signal usually consists of pulses derived from the metering equipment and the need for filtering does not arise. This controller does not meet all the requirements of an ideal controller either because it relies on the load hunting about the target value and requires a relatively large number of transmissions.

The operation of an integrating controller is illustrated by curve B in Figure 8. The overshoot depends on the response time of the load control system and the controller will continue to shed or restore load until the load integral recrosses the reference line. If a single output contact with hysteresis is used, then this operation continues until the load integral has crossed the dead band. The excessive shedding and restoration of load causes large swings in the total load as shown in Figure 9 which may be totally unacceptable. This type of controller can only operate successfully with load control equipment having a very fast response and even then additional logic and time delays are desirable in order to minimize the hunting.

One variation of this controller, which is intended for equipment capable of being switched at frequent intervals, restores load after a time delay. The system is arranged to cycle through all the loads and reinitiate each time delay just before the delay expires. The integrating controller is used to stop and start the cycle as the load integral crosses the reference line. The load excursions which result from this system are relatively small provided that the integrating controller has a small dead band.

The combination of a proportional and an integrating controller offers a solution to some of the problems described in the previous paragraphs. Either one of the controllers can act as the master controller with the other acting as an auxiliary controller. A proportional controller can be used as an auxiliary controller to limit the maximum and minimum load excursions which result from the hunting inherent in the integrating controller. The accuracy which can be achieved with this arrangement is better than that of an integrating controller alone and fewer transmissions result but the dead band of an analogue electromechanical integrating controller is too large for satisfactory results. A digital controller with separate raise and lower outputs and a small well defined dead band for a fast response would be very much more satisfactory.

An integrating controller can be used as an auxiliary controller to select appropriate set points in a proportional controller and so ensure that a steady load does not exceed the target but that the average value of a falling load is equal to the target. A reasonably fast response on the part of the integrating controller is once again desirable for accurate control. An experimental installation using an electromechanical integrating controller modified to reduce the dead band and a proportional controller in which the movement is shunted in order to move the set points relative to the load pointer, has demonstrated that the improved accuracy which results permits a larger load reduction without increasing the value of the energy which is deferred.

'n Rekenaarreëlaar kombineer die beste kenmerke van proporsionele en integrerende reëlaars met die vermoë om die las te bereken wat nodig is om in die teikenaanvraag te voorsien. Daar word van vergelyking 3 gebruik gemaak. Die werklike las word met die resultaat van dié berekening vergelyk en die reëlaar handhaaf die las op die ideale berekende waarde in plaas van op die ingestelde waarde. Analoog- sowel as syfermetodes is al gebruik om die nodige berekening te doen. By analoogreëlaars word daar op 0,3%-noukeurigheid aanspraak gemaak en in die geval van syferreëlaars sal die fout onbeduidend wees. Dié soort reëlaar voldoen aan die vereiste van volle benutting van die beskikbare energie en skakel ook die onnodige transmissie van bevele uit aangesien daar 'n regstreekse vergelyking tussen die werklike las en die berekende verwysingswaarde gedoen word.

5.3 Voorrangbeheer

Die tweede taak van die beheerstelsel is om te sorg dat alle verbruikers 'n gelyke deel aan die lasvermindering het. Dit behels die seleksie van die bepaalde las wat afgewerp of herstel moet word wanneer daar 'n sein van die aanvraagreëlaar ontvang word sowel as lasomruiling met geskikte tussenposes. 'n Ideale stelsel sal die ewewig selfs oor kort tydperke van slegs een uur bewaar, maar dit kan net ten koste van 'n groter aantal transmissies bewerkstellig word. 'n Stel voorrange moet daargestel word as grondslag vir die seleksieproses en hier lê die keuse tussen 'n laaste-af/eerste-aan-grondslag, 'n eerste-af/eerste-aan-grondslag en 'n wisselvoorrang-grondslag.

'n Beheerstelsel kan ook sonder 'n lasreëlaar werk deur 'n vastetydrooster met 'n arbitrêre werksiklus vir elke las gebruik te maak. So 'n rooster hou gewoonlik verband met verwagte laste en nie met werklike laste nie, en dit het gedurige ingryping nodig om te verseker dat alle verbruikers 'n gelyke deel van die lasvermindering het en dat hul las nie onnodig afgeskakel word nie.

Die grondslag van laaste-af/eerste-aan word gewoonlik in beheerstelsels in die nywerheid gebruik waar 'n aantal verskillende laste met verskillende voorrange beheer moet word. Dit kan uiteraard nie voldoen aan die vereiste om die beskikbare energie gelyk tussen 'n aantal eenderse laste te verdeel nie. Die grondslag kan egter tesame met 'n ander strategie gebruik word om daardie laste wat slegs in 'n noodtoestand afgeskakel moet word, te beheer.

Die grondslag van eerste-af/eerste-aan word algemeen gebruik want dit voldoen wel aan die vereiste van gelyke verdeling tussen 'n aantal laste en kan toegepas word sonder om uitermate ingewikkelde logiese stroombane te gebruik. Die ewewig word wel oor 'n lang termyn gehandhaaf, maar daar kan groot korttermynfoute voorkom as die tyd wat nodig is om die siklus te voltooi, met die duur van die spitstydperk vergelykbaar is. Die siklustydperk vergelykbaar is. Die siklustydperk kan verminder word deur die uitruil van laste dikwels te forseer, en as die siklustydperk na aan 30 minute is, sal dit 'n bevredigende ewewig tot gevolg hê. 'n Kort diklustydperk is ook nodig om die las op die grondslag van 'n veranderlike dienssiklus te verskaf en sodoende die hoogs moontlike peil van opgegaarde energie te handhaaf.

Die grondslag van wisselvoorrang vir beheer impliseer 'n reëlaar wat 'n aantal verskillende situasies kan herken en op 'n geskikte manier kan reageer. Die logika wat nodig is, kan baie ingewikkeld word en 'n interneprogramreëlaar is gewoonlik nodig. Die probleem van die verdeling van die beskikbare energie onder verskeie laste kan opgelos word deur 'n teller vir elke las te gebruik. Die telling neem toe teen 'n koers wat in verhouding staan tot die nadiversiteitsaanvraag terwyl die las af is, en die telling neem af teen 'n koers wat in verhouding staan tot die verskil tussen die werklike aanvraag en die nadiversiteitsaanvraag wanneer die las aangeskakel is. Die las wat ooreenstem met die teller met die laagste waarde word dan vir afskakeling geselekteer en die las wat met die teller met die hoogste waarde ooreenstem, word vir herstelling geselekteer. Dié benadering bring die bes moontlike ewewig met 'n minimum aantal transmissies teweeg aangesien elke bediening vir maksimum effek geselekteer is.

5.4 Toekomsontwikkelinge

Die snelle vooruitgang wat gedurende die afgelope dekade in halfgeleiertegnologie gemaak is, het tot die ontwikkeling gelei van vinnige en betroubare mikroverwerkers wat tesame met 'n permanente interne program al die vermoëns wat daar van 'n lasreëlaar vereis word, sowel as vermoëns waarvan die meeste gebruikers voorheen nie gedroom het nie, kan verskaf. Die rekenvermoë maak die berekening van die optimale las 'n eenvoudige saak, en dit kan aangevul word deur gemete en berekende waardes van die las wat afgeskakel en herstel is om die optimale tydperk vir elke bediening te bepaal. 'n Hele paar verskillende soorte las soos huishoudelike warmwatertoestelle, ondervloerse verwarming en grootmaatwaterverwarmers kan in een stelsel gekombineer word terwyl daar behoorlik met hul besondere kenmerke rekening gehou word.

Die potensiële aanvraag, nadiversiteitsaanvraag en oorblywende las kan bereken word en korttermyntendense wat die stelsel se werking affek-

A computing controller combines the best features of proportional and integrating controllers with the ability to calculate the load which is required in order to meet the target demand using equation 3. The actual load is compared with the result of this calculation and the controller maintains the load at the ideal calculated value instead of a present value. Both analogue and digital methods have been employed to carry out the necessary calculation and an accuracy of 0,3% of the target is claimed for analogue controllers while the error would be negligible with a digital controller. This type of controller clearly meets the requirement for full utilisation of the available energy and also eliminates the unnecessary transmission of commands since a direct comparison is made between the actual load and the calculated reference value.

5.3 Priority Control

The second task of the control system is to ensure that all consumers participate equally in the load reduction. This involves the selection of the particular load to be shed or restored whenever a signal is received from the demand controller as well as the initiation of a load exchange at suitable intervals. An ideal system will maintain the balance over periods as short as one hour but this can only be achieved at the expense of an increased number of transmissions. A set of priorities must be established as a basis for the selection process and here the choice lies between a last off first on basis, a first off first on basis and a variable priority basis.

A control system can also operate without a demand controller using a fixed time schedule with an arbitrary operating cycle for each load. Such a schedule is usually related to expected loads and not actual loads and needs frequent intervention in order to ensure that all consumers participate equally and are not shed unneccessarily.

The last off first on basis is usually employed in industrial control systems where a number of different loads with different priorities must be controlled. It cannot, by its very nature, meet the requirement of sharing the available energy equally between a number of identical loads. This basis can, however, be used in conjunction with another strategy to control those loads which should only be switched off in an emergency.

The first off first on basis is widely used since it does meet the requirement for equal sharing between a number of loads and can be implemented without using unduly complex logic. While the balance is maintained in the long term, large short term errors can occur if the time taken to complete the cycle is comparable with the duration of the peak period. The cycle time can be reduced by forcing the exchange of loads at frequent intervals and if the cycle time approaches 30 minutes, a satisfactory balance will result.

A short cycle time is also necessary in order to supply the load on a variable duty cycle basis and so maintain the highest possible level of stored energy.

The variable priority basis for control implies a controller which can recognize a number of different situations and respond in an appropriate manner. The logic required can become very complex and a stored programme controller is usually necessary. The problem of sharing the available energy between several loads can be solved by using a counter for each load and incrementing the counter at a rate proportional to the after diversity demand while the load is off and decrementing the counter at a rate proportional to the difference between the actual demand and the after diversity demand when the load is switched on. The load corresponding to the counter with the lowest value is then selected for shedding and the load corresponding to the counter with the highest value is selected for restoration. This approach results in the best possible balance with a minimum number of transmissions since each operation is selected for maximum effect.

5.4 Future Developments

The rapid advances which have been made in semi-conductor technology during the last decade have led to the development of fast and reliable microprocessors which, in conjunction with a programme stored in a permanent memory, are capable of providing all the features required required in a load controller as well as features which were previously undreamt of by most users. The calculating capability makes the calculation of the optimum load a simple matter which can be augmented by measured and calculated values of load shed and restored in order to determine the optimum time for each operation. Several different types of load such as domestic water heaters, underfloor heating and bulk storage heating can be combined in one system with due allowance being made for their particular characteristics.

The potential demand, after diversity demand and residual load can be computed and short term trends affecting the operation of the system

teer, kan in aanmerking geneem word. Gegewens wat langtermyntendense weerspieël, kan só opgeteken word dat vir latere gebruik deur die voorspelstelsel geskik is. Aanpasreëlaars wat die teikenwaarde verander om die lasvermindering te optimaliseer sonder om verbruikers te verontrief, lyk ook 'n praktiese moontlikheid.

6. LASBEHEERTOERUSTING

Die beheertoerusting vorm die skakel tussen die reëlaar en die opgaarinrigting. Die toerusting van onregstreekse beheer uitoefen deur die kapasiteit van die verbruiker se toevoer met 'n stroombreker te beperk of deur 'n maksimumaanvraagtarief. Dit is 'n aansporing vir die verbruiker om die een of ander vorm van lasbeheer op sy eie installasie toe te pas, en daar is verskeie soorte lasbeperkingsrelês juis vir dié doel ontwikkel. Dié soort beheer kan spitse slegs beperk, maar kan nie vir spitse wat deur ander onbeheerbare laste veroorsaak word, vergoed nie.

Tydskakelaars kan gebruik word om die toevoer van energie na opgaartoestelle te beheer en dié soort beheer kan vir verwagte spitse kompenseer hoewel dit nie verligting in noodgevalle verskaf nie. 'n Veerreserwe is noodsaaklik om seker te maak dat die skakeltye nie verander wanneer daar 'n kragonderbreking voorkom nie, en dit dra tot die installerings- en instandhoudingskoste van die tydskakelaar by. Die eerste soorte gesentraliseerde beheer was daarop gemik om die tydskakelaar met 'n betroubaarder stelsel wat ook in noodtoestande gebruik kan word, te vervang.

Moderne gesentraliseerde beheerstelsels is die gevolg van die steeds toenemende aantal toepassings en steeds toenemende vereistes wat deur die reëlaar opgelê word. Onlangse ontwikkelings in halfgeleiertegnologie is benut tot op die peil waar dit moontlik is om sulke vermoëns aan te bied soos die verskaffing van groepadresse tesame met 'n groot aantal individuele addresse, 'n reaksietyd wat in sekondes en soms in millisekondes gemeet kan word, die vermoë om 'n transmissie te onderbreek of 'n voorrangbevel uit te reik, outomatiese afskakeling in geval van 'n kragonderbreking met 'n egalige terugkeer van die las oor 'n tydperk van minute en die vermoë om 'n antwoordboodskap te versend waarin die stand van die las en die meteraflesing aangedui word.

Dié vermoëns kan alles bydra tot die verhoogde doeltreffendheid van die lasbeheerstelsel mits die reëlaar by die beheerpunt hulle kan benut. Met dat die jongste tegnologie volwassenheid bereik, sal geen net waarskynlik gebou of uitgebrei word sonder om staat te maak op 'n stelsel wat minstens 'n paar van die genoemde vermoës behels nie.

7. TEN BESLUITE

Die konsep van lasbeheer word in 'n groot aantal verskillende omstandighede toegepas en die beginsels wat die werking van 'n lasbeheerstelsel affekteer, kan van toepassing tot toepassing verskil. 'n Aantal beginsels wat op die beheer van spitsaanvraag van 'n elektrisiteitsleweringsliggaam betrekking het, word hieronder saamgevat:

(a) Die beheer van die energie wat aan verskeie soorte hitte-opgaartoestelle verskaf word, is 'n nuttige instrument vir die beperking van spitsaanvraag en vir noodlasbestuur.

(b) Die verhouding tussen lasvermindering en uitgestelde energie is nielineër en die lasvermindering per relê en gevolglik ook die geldelike opbrengs verminder na gelang die aantal beheerde opgaartoestelle vermeerder word.

(c) Groot variasies in die verhouding van opgaarenergieverbruik tot opgaarkapasiteit binne 'n groep plaas 'n beperking op die lasvermindering en die skepping van afsonderlike groepe is wenslik.

(d) 'n Doeltreffende beheerstrategie is noodsaaklik vir die verwesenliking van die volle potensiaal van enige lasbeheerstelsel.

ERKENNINGS

Die skrywer wens sy dank te betuig teenoor die verskaffers van elektriese toerusting en lasbeheerapparaat wat die tegniese inligting verskaf het vir gebruik in die opstel van die referaat. Die inligting wat in Tabel 1 bevat is was deur Motorola verskaf en is verkry van toetse wat deur Detroit Edison uitgevoer is.

BIBLIOGRAFIE

1. Simulation and Real Time Load Management Operation of Distribution Systems by Computer and Ripple Control R. Kniel — IEEE — Power Industry Computer Applications-konferensie, 1977.

2. Nuwe Ontwikkelinge op die Gebied van Oudiofrekwensieseintransmissie deur die Kragnet — VMEO — Verrigtinge van die Tegniese Vergadering, 1974.

3. Manage Loads to Reduce Capacity Needs — B. F. Hastings — Electrical World, Vol. 184, No. 10, 1975.

4. Die Aanwending van Oudio-frekwensie Afstandsbeheer op 'n Elektrisiteitsonderneming se Verspreidingsnet — J. K. von Ahlften — VMEO, Verrigtinge van die 35e Kongres, 1961.

5. Reken-outomaat-ingenieurswese — J. D. N. van Wyk — VMEO — Verrigtinge van die 41e Kongres, 1969.

taken into account. Statistics reflecting long term trends can be recorded in a form suitable for subsequent use by the forecasting system. Adaptive controllers which modify the target value in order to optimise the load reduction without inconveniencing consumers also appear feasible.

6. LOAD CONTROL EQUIPMENT

The control equipment provides the link between the controller and the storage device. The equipment may provide indirect control by limiting the capacity of the consumer's supply with a circuit breaker or by metering the consumer's demand. The consumer then has an incentive to implement some form of load management on his own installation and several forms of load limiting relay have been developed for just this purpose. This type of control can only limit peaks but cannot compensate for peaks caused by loads which cannot be controlled.

Time switches can be used to control the supply of energy to storage devices and this type of control can compensate for expected peaks but does not provide any relief in emergencies. A spring reserve is essential to ensure that switching times do not change when a power failure occurs and this adds to the cost of installing and maintaining the time switch. The early forms of centralized control were aimed at replacing the time switch with a more reliable system which could also be used in emergencies.

Modern centralized control systems are the result of an ever increasing number of applications and ever increasing demands imposed by the controller. Recent developments in semi-conductor technology have been exploited to the extent where it is practical to offer features such as group addresses combined with a large number of individual addresses, a response time measured in seconds and sometimes in milliseconds, the ability to interrupt a transmission in order to transmit a priority command, automatic switch off in the event of a power failure with a random return of the load over a period of minutes and the ability to transmit a reply message indicating the status of the load and the meter reading.

These features can all contribute to increasing the effectiveness of the load control system provided that the controller at the central point is capable of exploiting these features. As the latest technology matures it is probable that no network will be built or extended without relying on the existence of a system with at least some of the features listed.

7. CONCLUSIONS

The concept of load control has found application in a large number of different circumstances and the principles affecting the operation of a load control system may differ from application to application. A number of principles which relate to the control of the peak demand of an electricity supply undertaking are summarized below:

(a) The control of the energy supplied to various forms of heat storage devices consitutes a useful tool to limit peak demand and for emergency load management.

(b) The relationship between load reduction and deferred energy is non-linear and the load reduction per relay and hence the financial return decreases as the number of controlled storage devices is increased.

(c) Large variations in the ratio of stored energy consumption to storage capacity within a group impose a limit on the load reduction and the creation of separate groups is desirable.

(d) An effective control strategy is essential in order to realize the full potential of any load control system.

ACKNOWLEDGEMENTS

The authors wish to thank the suppliers of electrical machinery and load control equipment who provided the technical information used in the preparation of this paper. The information contained in Table 1 was provided by Motorola and was obtained from tests made by Detroit Edison.

BIBLIOGRAPHY

1. Simulation and Real Time Load Management Operation of Distribution Systems by Computer and Ripple Control — R. Kniel — IEEE — Power Industry Computer Applications Conference, 1977.

2. New Developments in the Field of Audio Frequency Signal Transmission over Power Mains — E. Baumann — AMEU — Proceedings of Technical Meeting, 1974.

3. Manage Loads to Reduce Capacity Needs — B. F. Hastings — Electrical World, Vol. 184, No. 10, 1975.

4. The Application of Audic Frequency Remote Control on an Electricity Supply Undertaking's Distribution Network — J. K. von Ahlften — AMEU — Proceedings of 35th Convention, 1961.

5. Computer Engineering — J. D. N. van Wyk — AMEU — Proceedings of 41st Convention, 1969.

BESPREKINGS

MNR. J. G. MALAN, Kempton Park:

Die outeurs moet gelukgewens word met 'n uitstekende referaat waarin hulle aandui dat daar heelwat meer in lasbeheer steek as wat sigbaar die geval is.

VERDIENSTELIKHEID

Die waarde van lasbeheer word besef wanneer die daaglikse laskurwe van die voorsieningsowerheid bestudeer word. Dit is gevind dat 'n kort, maar hoë spits van ongeveer een uur op weeksdae teenwoordig is, tussen 17h30 en 18h30 met die kruin om 18h00. Hierdie verskynsel is hoofsaaklik te wyte aan die aard van die las wat min of meer uit 60% huishoudelik, 15% nywerheid en 25% kommersiële verbruik bestaan, in 'n omgewing met groot werksgeleentheid wat beteken dat 'n hoë persentasie huisvrouens die huis om sê 07h30 verlaat en weer om 17h30 terugkeer met 'n kookvernuf wat vol verwagting is. Dit beteken ook dat die aanvraag na warm water gedurende hierdie spitstyd hoog is, wat 'n verlies aan diversiteit op waterverwarmerslas veroorsaak.

Aangesien beheer slegs effektief uitgeoefen kan word oor las wat oor 'n termiese stoorkapasiteit beskik, soos bv. waterverwarmers, ondervloerse verwarming, ens., is dit duidelik dat indien die toevoer na sodanige toestelle gedurende die spitstyd onderbreek sou word, 'n aansienlike afname in maksimum aanvraag bewerkstellig kan word. Indien verder in ag geneem word dat toerusting- en netwerkkapasiteite voldoende moet wees om die behoefte van hierdie eenuurlange spits te bevredig, en sou die las op 'n spesifieke netwerk die ontwerpkapasiteit oorskry as gevolg van 'n hoër verbruik van elektrisiteit wat die versterking daarvan noodsaak, dan blyk sodanige versterkingsprojek uiters onekonomies te wees.

Hierdie probleem is tot 'n groot mate opgelos op die Kempton Parkse netwerkstelsel deur die indiensstelling van rimpelbeheer. Die doel van my praatjie is dan om u meer te vertel van hierdie beheerstelsel wat in April 1978 in gebruik geneem is.

Daar is reeds veel gesê en geskryf oor hierdie installasie. Dit het selfs weerklank gevind in die vergadersale van Pretoria! Reg of verkeerd — laat my u gerusstel — die stelsel wat ons aangekoop het, vervul sy taak veel beter as wat verwag was. Dit is betekenisvol, want hierdie stelsel was die enigste van sy soort wat ten tye van ons ondersoek werklik in die praktyk op die Hoëveld beproef was. Verwagtings was dus gebaseer op konserwatiewe syfers verkry onder soortgelyke bedryfstoestande.

KOSTESTRUKTUUR

Ten spyte van die aansienlike verhoging in die koste van krag oor die afgelope drie jaar is ons op die Rand nog gelukkig om 'n M.A. heffing van R4,16 per kW te betaal, vergeleke met ons kollegas in die Kaap bv. wie ná aan R6,00 en in sommige plekke meer as R6,00 per KVA betaal. Dit moet egter verwag word dat die M.A. heffing aan die Rand nog sal styg, maar dat die kWh-koers sal daal met 'n gelykbreekpunt teen 'n redelike lasfaktor. Die voordeel van 'n spitslasbeheerstelsel is dat die delgingstermyn daarvan omgekeerd eweredig is aan die verhoging in aanvraagkoste terwyl die eenhede uitgestuur en derhalwe die inkomste daaruit verkry, konstant bly. Dit is duidelik dat hoe hoër die aanvraagkoste, hoe meer lewensvatbaar is die skema.

Die ekonomiese oorweging van hierdie tipiese voorbeeld is soos volg: 'n Aanvanklike kapitaaluitleg van R815 000 was aan die begin van 1978 gemaak. Installasietyd het presies ses maande in beslag geneem. Die stelsel was in gebruik geneem in April 1978, betyds om die behoeftes van die groeiende winterlas te bevredig. Teen die einde van November 1978, toe alle retensiegelde uitbetaal was, het die besparing aan aanvraagkoste reeds die bedrag van R254 000 beloop wat, indien rente buite rekening gelaat word, 'n delging van 31% binne agt bedryfsmaande verteenwoordig.

Voorts is 'n direkte besparing van R106 000 op die 1977/78 konsepbegroting bewerkstellig deur die kansellasie van verskeie voorgestelde 11 kV en L.S. netwerkversterkingsprojekte. Verder kon 'n voorgestelde 40 MVA 66/11 kV buitestasie teen 'n koste van meer as R1-miljoen vir minstens drie jaar uitgestel word wat, bereken teen 12% samegestelde rente, 'n verdere besparing van minstens R404 000 beteken.

(Terloops, dit moet uitgewys word dat mnr. Barnard se gasturbines met 'n aanvanklike koste van R18-miljoen teen 'n 12% samegestelde koers hom na 4 jaar R28,323 miljoen sal kos en dan sal dit langer as 4 jaar duur, in werklikheid 5½ jaar duur voordat dit self afbetaal is, gebaseer op 'n maandelikse aanvraagkoste van meer as R6 000/MW).

Die werklike delgingsperiode van die rimpelbeheerstelsel onder bespreking, met die veronderstelling dat die stelsel foutloos bedryf sal word en 'n maandelikse aanvraagkoste van R4 160/MW van otepassing sal bly, word soos volg bereken:

Veronderstel 'n twee jaar periode

	Kt	Dt
Kapitaal op gekanselleerde projekte	R106 000	
Rente en delging op gekanselleerde projekte vir twee jaar	27 000	
Rente en delging op uitgestelde projek vir twee jaar	254 000	
Besparing in aanvraagkoste a.g.v. lasbeheer	700 000	
Rente op besparing in aanvraagkoste	35 000	
Kapitale Uitleg, saamgesteld teen 12% vir twee jaar		R1 022 000
	R1 122 000	R1 022 000

Dit beteken dat die skema selfbetalend word binne 'n tydperk van net minder as twee jaar.

DIE INSTALLASIE

Die installasie bestaan uit 6 000 ontvangsrelês wat in privaat woonhuise geïnstalleer is, versprei oor drie — 11 kV toevoersones wat vanaf drie — 66/11 kV buitestasies gevoer word. Elk van hierdie stasies is toegerus met twee — 25 kVA, 1050 Hz motor-alternator omsetstelle tesame met hul gepaardgaande L.S. beheertoerusting, afsondertransformators, koppelingskondensators en smoorspoele, gekoppel aan die 11 kV geleistamme d.m.v. olie stroomverbrekers.

By die hoof invoerstasie is die meesterbeheertoerusting geïnstalleer wat die buitestasies d.m.v. loodskabels beheer. Die meteringsapparaat is direk aan die EVKOM printometer gekoppel by wyse van 'n teikenvergelyker wat die inkomende energiepulse tel en dit in 'n dubbele element registrerende wattmeter invoer. Hierdie instrument gee 'n grafiese rekord van beide die oombliklike aanvraag en die geïntegreerde aanvraag oor die eenuurlikse meterperiode. 'n Herstelpuls word elke 60 minute uitgestuur. Tans word die teikenlyn nog met die hand ingetrek en dit verskaf 'n handige verwysing aan die bedryfspersoneel oor die werklike vermoë van die stelsel om die teikenpunt te bereik aan die end van die eenuurlikse meterperiode. Dit word verwag dat hierdie funksie mettertyd ook deur die minirekenaars oorgeneem sal word wat tans die afstandbeheer- en telemeteringstelsels beheer, deur o.a. gebruik te maak van die formule $P = \frac{E - e}{T - t}$ vir die krag wat vanaf 'n gegewe tydstip nog getrek kan word vir die res van die betrokke meterperiode, soos beskryf deur mnr. Marloth.

Met die aanbreek van die wintermaande is dit heel eenvoudig om op 'n teikenwaarde te besluit aangesien dit bloot aangepas sal word met die groeiende maksimum aanvraag. Na die winter, egter, wanneer die maksimum aanvraag weer daal, is dit moeiliker om op 'n sinvolle teiken te besluit, veral as gevolg van die skielike koues wat dikwels vir nie langer as 2 of 3 dae tussen andersins heerlike lenteweer voorkom nie. Mnr Marloth, in sy referaat, noem dat 'n gesonde lasvoorspellingstelsel 'n noodsaaklike deel van 'n lasbeheerstelsel is en ek sou graag van hom wou verneem of hy alreeds so 'n stelsel opgebou het en indien wel, of die resultate beskikbaar gestel kan word. Ons moet nog vir die stelsel betaal en derhalwe neem ons geen kanse met teikenvoorspellings nie. Die veiligste is om maksimum las af te werp gedurende die eerste spitstyd nadat die EVKOM meterlesing geneem is en die gevolglike maksimumaanvraagsyfer te neem as die nuwe teikenwaarde.

TIPIESE LASKURWES

Fig. 1 toon die nadiversiteitsaanvraagkurwe aan soos gemeet gedurende November 1978 deur alle beheerbare waterverwarmers vir drie minute af te skakel. Die nadiversiteitsaanvraag word verkry vanaf die lasvermindering as gevolg van die drie minute toevoeronderbreking en word uitgedruk as 'n persentasie van die beheerbare las. Dit is interessant om daarop te let dat selfs gedurende somertyd die nadiversiteitsaanvraag op waterverwarmers gedurende spitstye in die orde van 40% van hul aanslagvermoë is. Teoreties beteken dit dat vir elke 3 kW waterverwarmer onder beheer, 'n maksimum aanvraag van 1,2 kW afgewerp kan word. Hierdie syfer behoort hoër te wees wanneer die wintertemperatuur daal.

Gedurende die eerste agt bedryfsmaande het die stelsel onder bespreking soos volg presteer:

Maand		Las afgewerp	las/relê
April	1978	4050 kW	0,77 kW
Mei	1978	9100 kW	1,52 kW

DISCUSSIONS

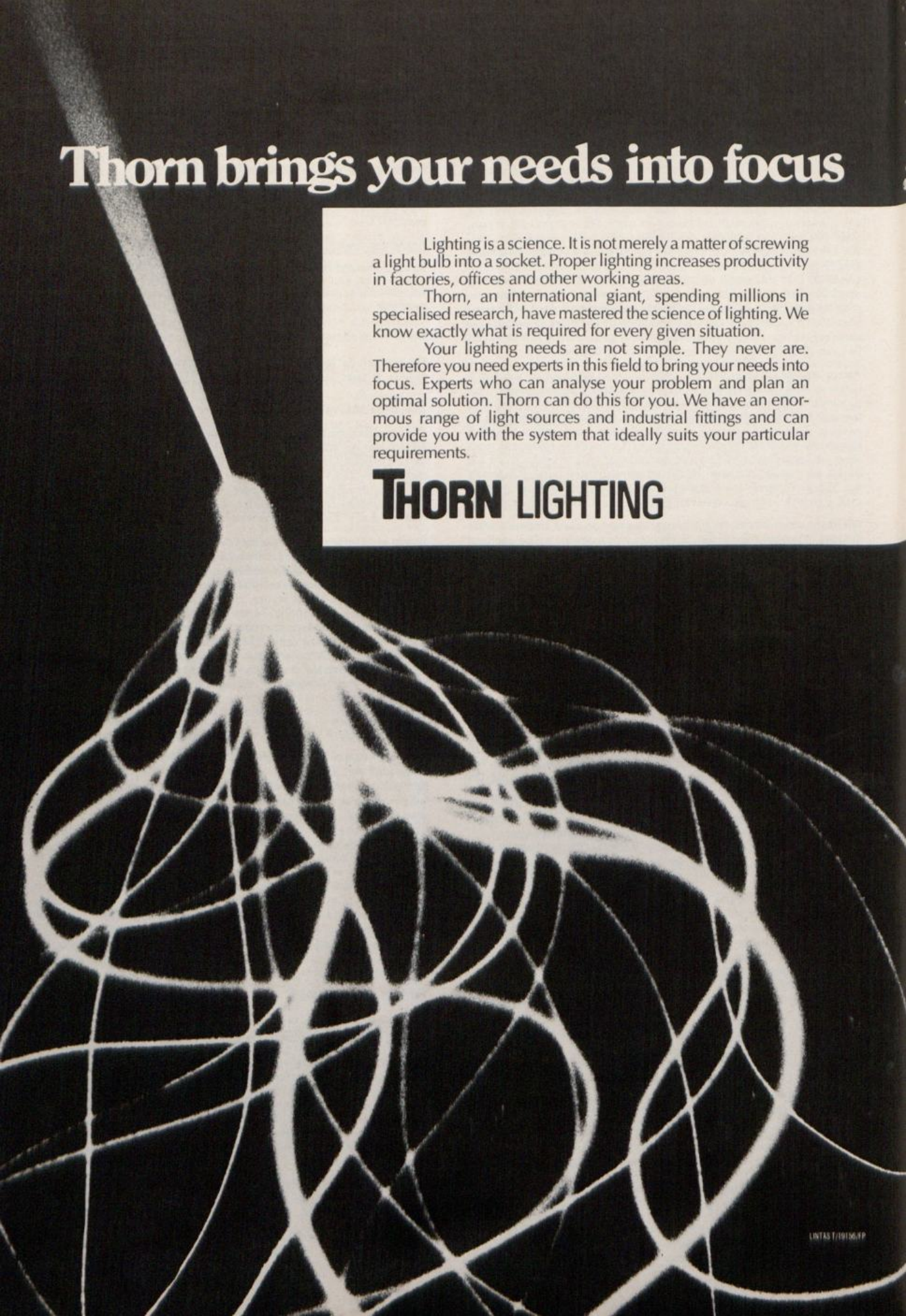
Thorn brings your needs into focus

Lighting is a science. It is not merely a matter of screwing a light bulb into a socket. Proper lighting increases productivity in factories, offices and other working areas.

Thorn, an international giant, spending millions in specialised research, have mastered the science of lighting. We know exactly what is required for every given situation.

Your lighting needs are not simple. They never are. Therefore you need experts in this field to bring your needs into focus. Experts who can analyse your problem and plan an optimal solution. Thorn can do this for you. We have an enormous range of light sources and industrial fittings and can provide you with the system that ideally suits your particular requirements.

THORN LIGHTING



LINTAS T/19136/FP

Junie	1978	10800 kW	1,80 kW
Julie	1978	7600 kW	1,27 kW
Augustus	1978	5000 kW	0,83 kW
September	1978	10100 kW	1,68 kW
Oktober	1978	10000 kW	1,67 kW
November 1978	1978	4000 kW	0,67 kW

Dit moet egter bygevoeg word dat voormelde prestasie behaal is as gevolg van entoesiastiese beheer en dat dit wel by tye ongerief aan die verbruiker veroorsaak het.

Die vraag ontstaan dan: Kan ons in Suid-Afrika, in die tye waarin ons leef, bekostig om nie by tye verontrief te word nie?

Die toevoeging van meer ontvangsrelês behoort die stelsel in staat te stel om die lasafwerping oor meer waterverwarmers te versprei en daardeur die werptyd te verkort om dieselfde resultaat te verkry.

Fig. 2 dui die daaglikse spitse op twee 66/11 kV buitestasies aan gedurende die koudste maande van 1976 en 1978, m.a.w. voor en na die instelling van rimpelbeheer. Die veilige transformatorkapasiteit van beide hierdie stasies is 15 MVA, hoewel dit vir kort tydsduurtes tot 20 MVA belas kan word. Dit is dus duidelik dat die vollasdatum van beide hierdie stasies uitgestel is en dat die versterking van die kragstelsel deur die ingebruikneming van 'n verdere 66/11 kV buitestasie tussen hierdie twee stasies, met minstens drie jaar vertraag kon word, soos voorheen reeds genoem.

Fig. 3 dui werklike maksimum aanvraag- en lasfaktorkurwes aan waarvan dit gesien kan word dat die gemiddelde lasfaktor oor die eerste agt bedryfsmaande met 5% verbeter het in vergelyking met die ooreenstemmende tydperk, die vorige jaar. Dit is ook opmerklik dat die beheerstelsel in staat is om daardie skielike diep valleie in die lasfaktorkurwe te verhoed wat normaalweg veroorsaak word deur onverwagte skielike koues.

In Mei 1976 het die onbeheerde M.A. opgegaan tot so hoog as 90 MW, terwyl twee jaar later in Junie 1976, is die beheerde MA op 76,24 MW behou. Vol-gens die weerburo was Junie 1978 die koudste Juniemaand in elf jaar.

STELSELVERMENGING

Hoewel die stelsel wesenlik 'n elektro-meganiese stelsel is, beter bekend as die 22-kanaalstelsel, het die vervaardigers 'n klein kodeopwekker voorsien, genoem die DECALATOR wat dien as 'n tussenganger tussen die 22-kanaalstelsel en die moderne elektroniese ontvangers. Die Decalator is hoofsaaklik bedoel vir daardie 22-stelsel gebruikers wie wil verander na elektroniese ontvangers, maar geen behoefte het aan uitbreiding van hul bestaande stelsel nie.

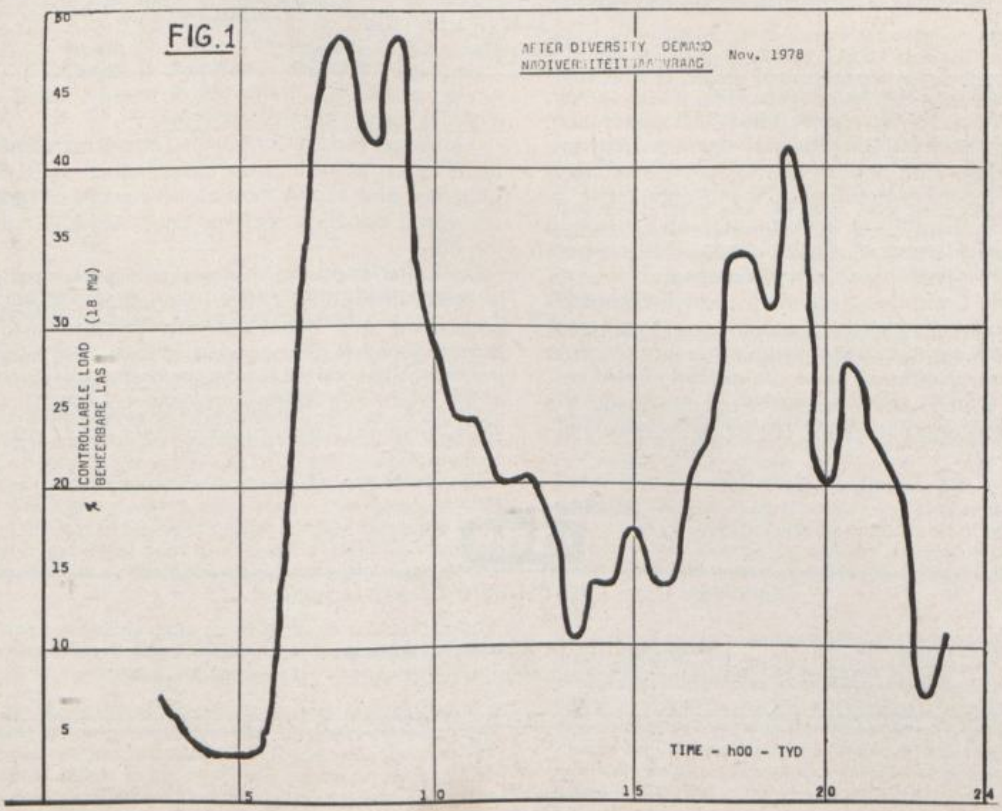
Ons belang in die Decalator spruit voort uit die feit dat tot redelik onlangs was daar nog geen elektroniese ontvanger getoets onder die bedryfskondisies van die hoogs intensiewe weerligatmosfeer van die Hoëveld nie. Tien elektroniese ontvangers is verkry en in woonhuise van lede van ons personeel geïnstalleer. Hierdie ontvangers word nou as 'n proefneming deur die Decalator geaktiveer. Die elektroniese ontvangsrelê se werking is geluidloos.

VERBRUIKERSAANVAARDING

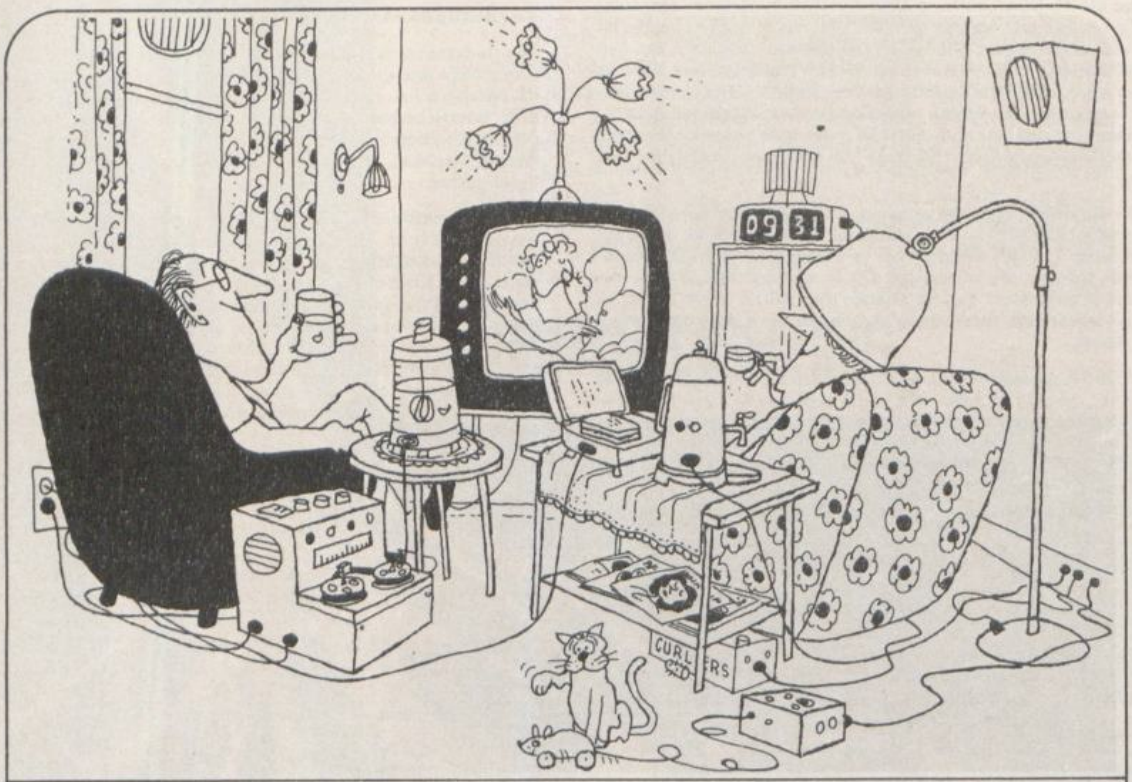
Die moderne mens hou gewoonlik nie van enige vorm van beheer oor sy persoonlike lewenswyse nie. Die ingebruikneming van hierdie spesifieke installasie het egter saamgeval met 'n era waartydens die uitdrukking 'Energiebesparing' aan die orde van die dag was. Hoewel rimpelbeheer nie energiebesparend is nie, maar eerder die beter benutting daarvan verseker, het die gedagte aan besparing in die algemeen goed byval gevind.

'n Aantal verbruikers het aanvanklik gemeen dat die stelsel verantwoordelik is vir 'n hoër verbruik. Dit was natuurlik te wyte aan die feit dat die stelsel ingebruik geneem is net voor die aanbreek van die koue winterweer. Klagtes oor 'koue water' is ontvang, gewoonlik ná strawwe beheerverrigting gedurende winterspitstye toe die ganse beheerbare stelsel vir tot twee ure afgeskakel is, maar in meeste gevalle,. nadat die meganisme van die stelsel aan verbruikers verduidelik is, het hulle oënskynlik hul aanvraagtye vir warmwater verander om by die nuwe omstandighede aan te pas. Die stelsel kan ongelukkig nie by die individu aanpas nie. Gedurende somermaande is geen klagtes oor 'koue water' ontvang nie.

Ten slotte herinner ek my aan die dame wat geskakel het om die volgende te sê: 'Sedert julle hierdie klein swartkassie geïnstalleer het, het ek koue water in my warm krane en warm water in my koue krane!'



The ever increasing Power Demand.



Everybody requires more and more power. Consequently, the peak loads of generation, transmission and distribution systems increase. The Supply Authorities want to satisfy everybody which means switching as many appliances as possible 'off' during peak periods and restoring the supply during off-peak periods. This is where the Zellweger Ripple Control comes in.

Ripple Control is a means by which numerous independent switching operations at different points are controlled throughout the network from one central control point. Audio-frequency impulses, superimposed upon the mains voltage, are used as a control medium. The existing power networks, apart from transmitting energy, serve as a carrier for the control impulses.

Zellweger Ripple Control also opens many other fields, such as calling-up maintenance staff, fire brigades, and allows centralised control of traffic signs and signals, street and shop window lighting etc.

Zellweger is one of the world's leading manufacturers of Ripple Control Equipment. Zellweger Equipment has been used to reduce electric power peaks in Europe and all over the world for more than 25 years. Would you like to know more about our Ripple Control Systems? Our experts will be happy to advise you. 01.2.110 E

Zellweger USTER

Zellweger Uster Ltd., CH-8610 Uster/Switzerland

Sole Agents in Southern Africa:
Farad Pty. Ltd., 5 Zambesi Road, Emmarentia/South Africa 2001 – Tel. 41-4446

MR. D. C. PALSER, Cape Town:

The theme of this year's convention, namely the "conservation and better use of electrical energy", is a most topical one and one that underlines the growing urgency, in the difficult and inflationary times that we live in today, of making more effective utilization of our increasingly costly and scarce resources, particularly capital and energy. The authors' joint paper on the "application of load management in electricity supply undertakings" is accordingly most appropriate and both Mr Barnard and Mr Marloth are to be congratulated on their excellent and thought provoking contributions.

An extremely wide and varied field has been covered ranging from the more effective utilization of plant and employment of capital resources to the conservation of energy and the minimisation of losses and wastage.

Of all the ways considered of more effectively utilizing plant and employing capital resources the ones that offer the greatest economic possibilities are peak load generation, such as by means of gas turbines, and energy transference systems, such as ripple control and pumped storage. In the first case capital is expended on meeting the peak while in the second case it is expended on cutting the peak. Whether it is more economic to meet or to cut the peak depends naturally upon the relative costs of the various alternatives.

Before considering the costs of these various alternatives, however, I would like to draw attention to a most important and decided economic advantage that ripple control has over the other alternative methods of meeting the peak. Since ripple control cuts the peak rather than meeting it, it permits the incremental cost of generation, transmission and distribution system reinforcement to be escaped. This clearly is not the case when gas turbines or pumped storage installations are employed.

Mr Barnard mentioned that the cost of transmission and distribution system reinforcement is around R500 per kW. I can confirm that this figure is of the right order. An analysis of the annual incremental costs of transmission and distribution system reinforcement for Cape Town over a thirty year period, corrected for inflation, give an essentially similar figure.

Let us now revert to a consideration of the costs of the various alternatives. By way of example it can be assumed that conventional generation (including also those cases where power is purchased from Escom) costs R500 per kW, pumped storage R300 per kW, gas turbines R150 per kW and ripple control also R150 per kW . Bearing in mind that ripple control permits the incremental cost of generation, transmission and distribution system reinforcement to be escaped, it is possible to draw up a simple table of comparative costs, as below, the figures being in Rand/kW .

	Ripple Control	Gas Turbines	Pumped Storage	Conventional Generation
Generation	—	150	300	500
Transmission and Distribution	—	500	500	500
Ripple Control	150	—	—	—
Total	150	650	800	1 000

From these figures it would appear that ripple control is by far the cheapest alternative, followed by gas turbines, pumped storage and conventional generation (including Escom bulk supplies).

If ripple control is the cheapest of the various alternatives, why then do we need to consider gas turbines and pumped storage at all? Fortunately, the answer is simple. In a typical municipal system the shape of the load curve only permits about 5% of the system peak demand to be cut by means of ripple control under normal operating conditions. With gas turbines 10% or more is not uncommon. And with pumped storage, depending upon the differential between the system peak and the night valley, as much as 30% or more is possible. Hence, even though the cost per kW of gas turbines and pumped storage is higher than ripple control, these higher unit priced alternatives enable a larger percentage of the peak to be met with a correspondingly greater overall financial advantage.

For the smaller municipalities ripple control is the obvious and virtually only choice open to them. But what about the larger municipalities? What about gas turbines and pumped storage?

The opinion has been expressed in certain quarters that municipalities should not meet system peaks by providing their own peaking plant, namely gas turbines or pumped storage, but should rather cut peaks by switching out load, such as by means of ripple control for instance. The argument advanced, and one which incidentally is not disputed, is that Escom can provide peaking plant more economically than can the municipalities by virtue of greater diversity and economy of scale.

It has also been said in the same quarters that if municipal electricity undertakings can achieve savings through the provision of their own peaking plant then tey are doing so at the expense of all other consumers of Escom. If this is so then rectification of this situation lies with Escom and not the municipalities. Since the municipalities give Escom the contractually prescribed notice of their future anticipated maximum demands — in the case of Cape Town this is three years — surely it is up to Escom to plan the development of its generation and transmission systems accordingly to meet these demands in as economic a manner as possible. As the prescribed period of notice is fixed by Escom, Escom cannot claim it has not been given adequate notice of municipalities' intentions. Escom also formulated its own tariffs. If these tariffs do not correctly and equitably reflect costs, then the fault lies with Escom, not the municipalities.

It is no good making emotional appeals to municipalities not to provide their own peaking plant. All the municipalities are doing is playing the game according to the rules. And who makes the roles? Escom! The municipalities are merely exploiting Escom's tariff to their economic advantage. And if this is not in the national economic interest as alleged and certain municipalities are achieving savings at the expense of other consumers, then it is up to Escom to change the rules.

Under today's conditions Escom's standard two-part maximum demand tariff is quite unsuited to the needs of the larger municipalities. What is required is a greater degree of sophistication in Escom's tariffs to reflect the difference in cost between generation plant of widely varying marit rating. It is done overseas. For instance, it is not uncommon in Europe for certain large used tariffs to have two demand rates, namely a standard rate and a lower short-term on-peak rate, and three unit rates, namely peak, day and night rates, all with the objective of reflecting more accurately and equitably the time incidence of costs as dictated by the merit rating of generating plant. If it is expected that municipalities should act in the national interest then it is up to Escom to act first and pass on to the municipalities the lower demand costs of its peaking plant by way of an equitable inducement in the form of more sophisticated tariffs. If others can do it, why not also Escom? Finally, surely anything that municipalities can do to improve their system load factors, and anything that Escom can do to improve its system load factor, can only but be in the overall national interest. I think we would all welcome Escom's views on these matters!

Having got that one off my chest let's get back to the larger municipalities and gas turbines and pumped storage!

Firstly, I would like to correct a misconception, again held in certain quarters, that pumped storage should be lumped with gas turbines and considered as peaking plant. Pumped storage plant is not generating plant per se but rather energy transference plant designed to shift load from on-peak to off-peak periods. As far as Escom is concerned, looking back into the municipal system, there is nothing electrical to distinguish pumped storage installations from more conventional installations that switch out load, such as ripple control installations for instance. In each case the basic principle is the same, namely the transference of blocks of energy from on-peak to off-peak periods. I consider it important to recognise this distinction and not look upon pumped storage installations as generating plant in the more conventional sense.

To show that we are not altogether backward in the Cape, I would like at this juncture to mention that Cape Town first installed ripple control way back in 1956 but abandoned the scheme some seven years later because of various problems, including resonance. Ripple control, which was in its infancy in those days, has come a long way since then. On an overseas study tour last year I was fortunate in being able to visit the works of six of the major ripple control manufacturers in Switzerland, Germany, France and Britain and to visit a number of typical installations. From this tour it was quite apparent that the adoption of lower frequencies and the employment of solid-state electronic equipment will soon be the industry standard along with control by means of mini-computers and all the flexibility that goes with such control.

I also noted on this overseas tour that increasing use is being made of mini-computers and process computers, not only to increase the flenibility and usefulness of ripple control systems, but also as part of higher level systems, such as for economic load scheduling and load despatching, to optimise the utilization of the various generation sources and load management systems. Because of rapidly decreasing prices of computers we can look forward to an increasing use of computers in this field in the very near future.

Cape Town I might mention also has a gas turbine, a 40 MW unit installed some six years ago. This unit has given excellent service and apart from emergency usage, has been economically employed to meet system peaks and to act as spinning reserve. Incidentally, in those days the installed cost, including civil works, was a mere R65 per kW .

You will probably have noted from Mr Barnard's paper that Cape Town also has a hydro-electric pumped storage scheme. This installation is a 180 MW one comprising 4 X 45 MW reversible pump-turbine motor-generator sets. The first set has just been placed into commercial operation and it is hoped that the station will be fully operational in time to meet this year's winter peak.

As this is the first pumped storage scheme in the country, and I believe the first in Africa, you may be interested in a few brief particulars. The motivation for embarking on this scheme was largely economic although there are also clearly security of supply advantages as well.

The scheme was approved early in 1975 at a total estimated cost of R40,6 million (at 1974 price levels). This figure included engineering and supervision costs and capitalised interest during construction, which together amounted to 20% of the total cost. On the basis of these estimates the basic plant cost, both electro-mechanical and civil with all ancillary works, was around R180 per kW . Engineering and supervision costs and capitalised interest during construction increased this figure to about R225 per kW . Today the comparative estimated final cost is R64 million. On the basis of this final estimate the basic plant cost will be about R290 per kW with capitalised interest during construction and the other items increasing this figure to an all-inclusive total of R355 per kW . At first sight the escalation in cost appears high but over the five year period concerned it represents a mean escalation rate of less than 10% per annum. This is the figure assumed in the original viability study and is in line with general inflationary levels over this period.

The installation promises to show an excellent rate of return on investment and to be even more economically viable than originally estimated largely because of the recent unprecedented steep increases in Escom's tariffs and despite a general drop off in load growth following on the economic recession. It is anticipated that the scheme will pay for itself well within a decade of commissioning. For a major scheme with a life of at least 50 years this is a relatively rapid payback period. I think the message is quite clear — don't put your money in the bank, buy yourself a pumped storage installation instead! I could go into far more detail about pumped storage but unfortunately time does not permit.

Whether one should install ripple control, gas turbines or pumped storage is largely a question of generation mix and size of the system. For a relatively large system, such as Cape Town, it is considered that the optimum mix is a combination of base load from Escom, coal-fired municipal plant, pumped storage, gas turbines and ripple control. Because of the complexity of the operational problem the use of a high level computer control system in such applications is virtually essential. Overseas off-line computers have been employed for this purpose but the current trend, because of decreasing costs, is towards on-line control.

I would like now to consider one or two other matters arising out of the paper.

Both Mr Barnard and Mr Marloth, and Mr Malan in his contribution to the discussion, all refer to the deferment of capital investment on additional generation capacity (either direct or bulk purchases from Escom) and transmission and distribution capacity made possible by the provision of ripple control installations. It is claimed that this deferment of investment has a financial value. I would submit that it has virtually none whatsoever in the inflationary world we live in today. In pre-inflationary days deferment of capital investment certainly had value, both in money terms as well as in real terms. But today, with inflation levels generally matching interest rates if not in fact exceeding them at times, the deferment of capital investment has virtually no value, if any at all, in real terms albeit it might have value in money terms. Let me quote an example to illustrate the point. Suppose a R100 investment is deferred for three years at an interest rate of 10% per annum. After three years your R100 with compound interest would be worth about R133. In money terms you would be R33 better off. But because of inflation and escalation in costs over the three year period at, say, an escalation rate of also 10%, the same R100 worth of capital goods would now cost you R133. Hence in real terms you have gained nothing at all. In fact, if inflation rates exceed interest rates, as they have often done in the past and could well do again in the future, you would in fact be worse off in real terms through deferring capital investment. So do not be deluded into thinking that deferring capital investment always pays. More often than not today it does not!

Turning now to another matter, Mr Barnard referred to the economic advantages of mercury or sodium vapour street lighting installations over the more conventional incandescent lamp installations. We in Cape Town carried out a detailed economic investigation into the conversion of the city's entire incandescent lamp installation to mercury vapour some ten years ago. The investigation indicated appreciable financial savings, coupled with a three-fold increase in illumination levels. The conversion was successfully completed over a six year period some four years ago and an analysis of the results has confirmed the original estimates. The savings are indeed considerable and amount to about 10% on the overall annual operating costs of an incandescent lamp installation.

In today's economic climate it is deemed essential to utilize gas discharge light sources in the interests of energy conservation. The employment of incandescent street lighting installations is just no longer economically warranted.

On another subject now I note that Johannesburg is currently installing an automatic underfrequency load shedding system in association with Escom as part of a national programme. Cape Town is also participating in this national programme and installed a comprehensive computer controlled under-frequency load shedding system in co-operation with Escom some five years ago.

The Cape Town system employs under-frequency relays that shed load under computerised supervisory control in accordance with a predetermined programme that takes into account candidate loading and priority and Escom import. On loss of Escom import load equal to or in excess of the lost generation capacity is shed. Under extreme conditions islanding of the power stations is resorted to.

To assist in cases of a gradual and sustained decline in frequency the system was slightly modified at the request of Escom about a year after commissioning to provide under such conditions for the shedding of load equal to a predetermined percentage of the Escom import.

With the commssioning shortly of the city's Steenbras pumped storage scheme a more onerous condition could arise should the Escom import be lost while pumping at night at full capacity. The attendant generation/load mismatch would then be so severe, and the risk of damaging Council generation plant so high, that extremely rapid islanding of the power stations will be necessary. To meet this possible condition the under-frequency relays at the power stations are being modified to incorporate a rate-of-change of frequency element to discriminate between rapid and slow rates of change of frequency to facilitate the taking of appropriate corrective action.

Since commissioning some five years ago the system has operated on eleven occasions and has successfully assisted in restoring system equilibrium and prevented the shutdown of the city's power stations. On two occassions it was necessary to island the power stations. I can accordingly confirm that these under-frequency systems really do work!

Looking now at other energy sources I would like to consider briefly solar energy. In Cape Town the City Engineer and myself have investigated this subject in some detail and Council has already authorised us to embark on a trial installation to assess more accurately the various practical and economic implications. The economics of solar energy installations as such is quite straightforward and, as in all economic assessments today, depends largely upon the difference between the net-of-tax cost of money to the consumer and the assumed rate of inflation.

Mr Barnard has suggested that electricity undertakings, backed by the AMEU, should take the lead in the introduction of solar water heaters because they are so deeply involved. I regret to state that I do not fully accept this view. Solar heaters per se are not electrical and their installation, except in the more sophisticated electrically controlled units, is nothing more than a plumbing job. Also the types employed and the materials used in their construction, as well as the aesthetics and town planning implications of their installation, have nothing to do with municipal electrical engineers. All these aspects are matters for the town engineer, not the electrical engineer.

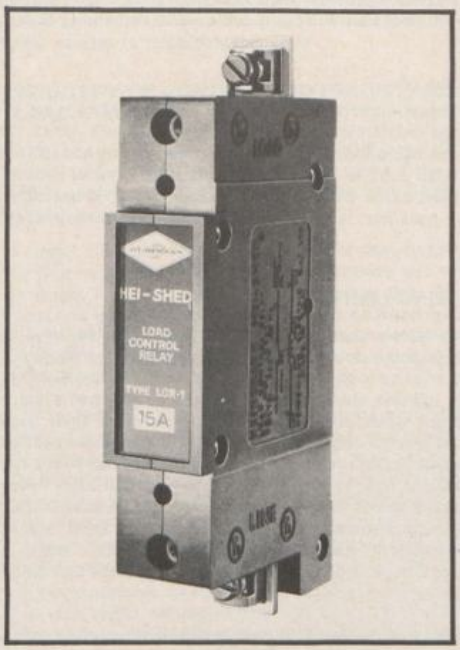
I would hasten to add that I am not advocating that we, the country, should not do everything possible to advance the more effective and widespread use of solar energy. On the contrary I fully support such national action. All I am suggesting is that solar energy installations are not really the province of the town electrical engineer but rather that of the town engineer. If anything, as this is a national problem, the lead should come from the government working with such bodies as the NBRI, CSIR, SABS and including the AMEU, as well as mechanical and civil engineering bodies, universities and industry.

As part of this national committee, the AMEU could consider such matters as the likely influence on electricity costs consequent upon the widespread adoption of solar energy installations as well as other related electrical matters such as for instance tariffs, either with or without ripple control tariff switching.

I would accordingly support the idea of an AMEU committee to consider the electrical implications of solar energy, but not in isolation. I feel that a formal approach should be made to the government to take

HEINEMANN

HEINEMANN ELECTRIC (S.A.) LTD.
P.O. BOX 881, JOHANNESBURG 2000
TRIPSWITCH DRIVE, ELANDSFONTEIN.
TA: TRIPSWITCH JOHANNESBURG
TELEX: 436372 SA. TEL: 36-7033



HEI-SHED LOAD CONTROL RELAY TYPE LCR-1

FEATURES

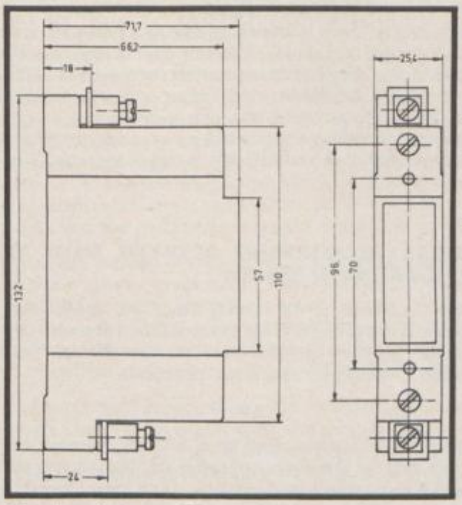
- ☐ Uses hydraulic magnetic principle of operation.
- ☐ Accurate trip points irrespective of ambient temperature.
- ☐ Quick reset when primary circuit is switched off.
- ☐ Clip in or surface mounting
- ☐ Attractive appearance.

The new HEINEMANN Load Control Relay has been produced with energy saving in mind and to meet the fast growing need for control devices of this type, which — by their operation — help directly to reduce peak load.

With known world energy sources slowly dwindling the "save it" campaign is already well established with actual consumers looking more closely at their costs for electricity consumed and Municipal Authorities and Supply Undertakings becoming ever more anxious to reduce peak demand without severe inconvenience to the customer.

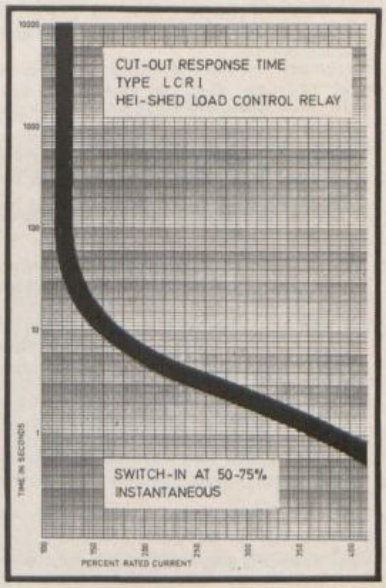
The Hei-Shed LCR-1 unit, if fitted as a rule,on large City and Municipal development could contribute effectively to stability and control of supply at peak hours. It could thus help to prevent the major black-outs, such as have begun to occur due to overloading of systems when generating capacity is stretched to its limits

The automatic operation of the Hei-Shed can be pre-planned by the Engineer or Consultant to fit admirably into his plans for economic design of installations due to its effect on diversity of load under peak or other defined conditions of supply.



Operating characteristic

1. Calibrated to switch off the controlled circuit at 125% of Main Circuit Rating chosen. Max. time delay 2 mins.
2. Unaffected by "Hot" or "Cold" start, or ambient conditions.
3. Automatically switches controlled circuit back on at 50 — 75% of Main Circuit Rating chosen.
4. Immediate re-switching of controlled circuit at Zero Main Circuit Load.



Construction

The Hei-Shed Load Control Relay is soundly based on the well proven Hydraulic Magnetic principle and the device is therefore generally free from characteristic change due to ambient variation. It is also able, due to the Hydraulic Magnetic principle, to differentiate accurately and swiftly to sudden load change, so that there is no thermal inertia delay involved.

The hydraulic magnetic design monitors directly through its series connected solenoid the current in the main circuit such that at a pre-selected point the hermetically sealed magnetic core moves against a spring along the dashpot to the top of the solenoid. At this stage the magnetic reluctance has reduced sufficiently so that the armature is attracted to the solenoid and it is this armature which operates an adjusted lever to switch off the controlled circuit. The dashpot itself is filled with carefully selected oil, thus providing the product with the well known time delay characteristic accompanying this type of design.

Reduction of the Main supply below the preset tolerance band of current allows the magnetic core to return to its original position thus releasing the armature and allowing the Controlled Circuit switch to reclose.

The propriety switch used to interrupt and restore the controlled circuit is carefully selected for its reliability and performance and is supported by the well established HEINEMANN guarantee arrangements.

HEINEMANN

HEINEMANN

the lead and set up a national committee on which the AMEU, along with other interested bodies, could and should serve and I accordingly advocate such action.

In conclusion, I would in passing refer to a novel solution to the energy problem that we are looking at in Cape Town, namely the burning of municipal refuse. The city has just completed the installation of a modern refuse pulverising plant adjacent to its coal fired Athlone power station and the feacibility of burning the combustible component of the refuse on the conventional chain grate stokers as a supplementary fuel is currently under investigation with a view to the possible installation of a small pilot scheme to assess the various practical and economic implications.

Typical installations overseas have been visited and studied. Many of the problems associated with the combustion of refuse have been largely overcome by suitable changes in boiler design and plant operation. However, the special design needed for this type of fuel, where the low temperature combustion chamber conditions, the low rate of heat release from a fuel with a calorific value only one-third that of coal, the additional air requirements and the need for a specially designed grate to burn a non-homogeneous fuel, all combine to result in a considerably higher kW.h cost than for a conventional power station boiler.

The approach being followed in Cape Town, however, is similar to that being followed in certain overseas installations where refuse is burnt as a supplementary fuel along with coal on conventional coal burning chain grate stokers. In this type of installation the combustible fraction is blown after suitable treatment into the combustion chamber where a high proportion is burnt in suspension with the heavier elements falling onto the front of the grate. This system has the added advantage that the coal supply can readily be increased to meet fluctuations in the supply of refuse.

It is estimated that the annual energy available from the city's refuse is equivalent to about 30 000 tons of coal, which at current Cape prices amounts to about R750 000 per annum. The cost of the plant required is not excessive and it is estimated that the net advantage to the city could well be in excess of half a million Rand a year.

I could comment at length on a number of other matters arising out of the papers but as I have already taken up too much time I will conclude at this point.

MR. R. KNIEL, Affiliate:

First I would like to congratulate the authors on their outstanding paper: they have been able to give an excellent view on a complex subject, mentioning all relevant points yet remaining precise and concise.

I would like to comment on four different points:

1. SHAVING THE PEAK OR FEEDING THE PEAK?

In Part 1 the author discusses several methods of reducing the peak demand of the distribution network either by reducing consumption during peak demand times (by disconnecting non-essential loads) or by producing power locally during these time periods (by means of gas turbines or pumped storage schemes). Not considering presently the described methods of switching low priority feeders and voltage reduction which can only be used in emergency conditions, the question arises whether more than one method should be used and if so, in which order.

The answer is easy: all methods reducing the peak demand which lead to marginal costs lower than the peak demand charge should be used starting with the method showing the highest cost effectiveness. Of course, in doing this one has to consider secondary effects such as the maximum permissible interruption of supply in the case of water heater control and the cost of the fuel for gas turbines.

If we consider, for the sake of simplicity, only very short peak periods these effects may be neglected and a comparison of the capital costs and the relative effectiveness of the systems alone will determine the preference order.

A point which is often mentioned but still often neglected in te economic calculations is the fact that load control reduces not only the demand charge at the high voltage level but also the peak demand in many parts of the distribution system itself. Hence, after the introduction of such a control scheme the reinforcement of the high and low voltage distribution systems can be postponed. This increases the financial effectiveness of such a control scheme appreciably: The municipality of Kempton Park has reported a total saving of R387 000 in a two year period for its own distribution system as compared to a R700 000 saving in demand charges. The ratio of savings in the distribution system to savings in demand charges is hence 55%. From the figures given by P. Hertogs and R. Tritz in their 1964 report to the UNIPEDE a similar ratio is calculated to be 60% and in a former study I came to a similar conclusion, namely 71%. Therefore, it can be considered as reasonably certain that a method of peak demand control such as decentralized water heater control provides an additional saving in the distribution system of more than half of what is achieved in demand charge reduction.

Making a comparison between the capital cost of various types of peak generation and distribution capacity available in South Africa and the capitalized cost of providing the equivalent generating and distribution capacity by load control, it is apparent that load control is more cost effective in most cases. Under these conditions, load control should be used to shave peak first in order to obtain the best return on capital investment.

2. OPERATING LIMITS

Mr. Marloth shows that the maxcimum permissible limit of the switching-off period is determined by those consumers with high energy consumption relative to the rating of the installed heater and he suggests rightly in my opinion, that consumers should be grouped according to the ratio of hot water consumption to the rating of their heaters. I believe that this is an original idea and that it can improve the effectiveness of water heater control especially in those cases where the peak demand period is followed by a relatively long and high "shoulder" period. In fact, it would be easy to use a preferential channel for those consumers having a small capacity water heater coupled with a large number of persons in the household and a separate channel with a longer interruption period for those having a large tank and few people in the house.

To my knowledge it has been the rule in almost all countries having implemented water heater control to divide the water heaters suitable for control into a number of groups irrespective of their relative sizes. The required switching-off time is shared as equally as possible among all groups with the result that those consumers have a large consumption for the relative size of their heaters determine the maximum off time for reasons of consumer satisfaction and hence, impose a rather severe limitation on the whole group. A grouping of consumers as suggested, even a crude one, according to the relative consumption will definitely ease these constraints and considerably increase the effectiveness of control.

3. NON-LINEAR RELATIONSHIP BETWEEN LOAD REDUCTION AND DEFERRED ENERGY

The conclusion reached in 7b namely that "the above mentioned relationship is non linear and that the load reduction per relay decreases with increasing number of controlled storage devices" although definitely correct, requires, I feel some comment.

For a given load curve and assuming for all heaters the same maximum permissible off-time for reasons of consumer satisfaction, it is clear that there is a limit beyond which load reduction is no longer linear with the number of devices. However, until this point is reached the load reduction is in fact linear with the number of controlled loads. The critical point, of course, is to determine where this limit lies. The "peakier" the load curve is, the more loads can be controlled before reaching the limit, which occurs when the peak becomes so flat that all controllable water heaters may not be switched off for its duration, either for reasons of consumer satisfaction or avoiding so-called secondary peaks.

The most suitable tool for this assessment is definitely a computer simulation. A programme has been written permitting determination of the amount of load reduction given any particular load curve, number and type of water heaters, number of control channels and a given switching strategy. The input parameters can be readily modified so that a complete investigation can easily be made. It is operational in this country.

The second important point to consider, I feel, is that even once the limit of linearity is surpassed the load reduction per controlled load

decreases only gradually, depending again on the shape of the load curve.

The problem arises then to determine to what extent beyond this limit of linearity the control of water heaters should be implemented. In other words, it is worthwhile to equip all the water heaters with a relay of some of them only?

In fact, the control of further load shoud only be discontinued when the return on investment of further relays becomes lower than the return on investment of the method of peak demand reduction which is next on the preference list. If no other method is practical, further control should be discontinued when the marginal cost of control is equal to the marginal savings in peak demand costs.

4. STRATEGY OF CONTROL AND PREDICTABILITY OF THE LOAD CURVE

It must be stressed that the proper setting of the target demand requires knowledge of the future shape of the load curve if the constraints imposed by consumer satisfaction are to be met and the maximum saving in demand costs are to be obtained.

If the target is set too high the constraint of maximum permissible off time will be met easily but the full possible saving will not be achieved. If the target is set too low the disconnection time of certain or all channels will grow beyond the duration considered to be compatible with consumer satisfaction. When this second point is reached there are theoretically two possibilities: either the economics of load control or the consumers' comfort prevails.

It must be realised however that maintaining consumer comfort by switching a large number of water heaters simultaneously is generally speaking grossly uneconomical. Switching-on of water heaters after a prolonged off period at a time when the network load is still high would produce such a load pick-up as to annihilate the benefits of load control, possibly even creating a new peak higher than the one without any control. This is because of the loss of diversity of water heaters after a prolonged interruption of supply.
Therefore, in such a case there is practically no other possibility than to increase the target setting as soon as it becomes apparent that the switching-off time will be too long. This operation will not prevent the desirable maximum disconnection time to be exceeded but it will not be grossly exceeded. In any case the new demand setting will not be exceeded. If it were possible to give a value in Rand to excess switch-off times (obviously a none linear function of its duration), and provided a powerful enough real time processor were used, it would be possible to adjust the demand target automatically assuring minimum overall costs (demand cost + nuisance value of too long a switching-off time). However, this seems to me somewhat futuristic especially in view of the difficulty of assessing this nuisance value. What is realistic is the requirement for modern load controllers to supervise the switching-off time of different channels and to alarm personnel as soon as it becomes apparent that the permissible duration is going to be exceeded.

A day-to-day forecast of the load curve is possible either manually or by a suitable computer programme. There are many publications describing on-line forecasting of load curves for the next 24 hours in advance. Some use a polynominal approximation, others a harmonic approximation, the co-efficients of the polynoms or Fourier series being dependent on outside temperature, day of the week and season.

In order to obtain proper results it is necessary to calculate these co-efficients using a great deal of data, and even so, the accuracy obtained to date has not been better than several percent. Furthermore, to my knowledge, existing programmes have no provision for considering single events which can have a marked influence on the shape of the load curve such as late TV transmissions of particular interest, public holidays, etc.

If such a forecasting programme were to be implemented by a water heater controller, it would be possible to determine automatically the lowest possible demand target still meeting the constraints of consumer satisfaction for that day.

It is, of course, not possible to forecast a month in advance the demand curve during the day with the highest demand, especially in view of a possible cold spell during this period. We all know how difficult it is to predict the weather from day to day, let alone a month in advance. This however does not seem to be necessary, as a load forecast can be made at the beginning of the month for the monthly peak day under the assumption that the climatic conditions will be favourable. If the assumption is correct the load controller will disconnect load in such a way that on the day of the highest demand the switching off time limits will be reached.

If a cold spell occurs in this period and the demand setting of the controller remains as it is, these limits would be exceeded. It is, therefore, necessary under these conditions to increase the target demand accordingly. This can be done manually as needed because forecasting temperature a day in advance is always possible and relatively accurate. Of course, if this cold spell could have been predicted at the beginning of the month the proper demand target setting would have been made and less switching of the water heaters would have been needed before the cold spell occurred. This however provides only a very small advantage especially considering that normal operation of water heater controls does not bother the consumer at all.

Here again this forecasting and adjustment process can be automated provided a powerful enough processor is used. However, until enough data is available for calculating the co-efficients of the forecast algorithm, manual forecasting of the load curve and subsequent adjustment of the target demand, possibly with the aid of a simulation programme, is the obvious choice.

In conclusion, I would like to summarize the features a modern load controller should include:

- ability to control a large number of channels to assure smoothness of the controlled load curve.
- possibility of controlling channels with different priorities (small and large water tanks)
- possibility to control channels with different priorities (small and large water tanks)
- capability for monitoring the switching-off time of the different channels and for giving alarm operating personnel if the permissible time limit will be exceeded.
- interchange of channels so that channels with the same priority have the same average switching-off times.
- use of a strategy minimizing the number of operations and avoiding "hunting", although this requirement is not as important for modern, fully electronic ripple control systems as it was for electromechanical systems.

MR. F. M. HESSE, Affiliate:

For the electrical engineer to operate an efficient and cost-effective network, he should be provided with the tools necessary to monitor and control all aspects of that network.

Telemetry, metering and recording equipment will provide quantitative information on energy, current, power, voltages, and any other variables which may be useful in the decision-making process.

Supervisory and telecontrol equipment will monitor all alarm conditions and statues and provide controls from a centralised point.

Load monitoring and control equipment will enable selective load shedding to be undertaken.

These facilities form the basis of an energy management system.

Mr Marloth's extremely interesting presentation on load control will provide both members and affiliates with a sound base for any peak load lopping requirement that they may have.

It becomes clear that a computing controller will provide the best solution to any load control problem where the maximum demand is based on megawatts integrated over a specific period of time. However, a computing controller may equally well be used in conjunction with thermal M.D. meters.

In addition to priority control, it would be very useful to be able to assess the magnitude of the disconnected load as well as the magnitude of the load to be reconnected. An assessment of the actual load shed may be obtained by measuring the power just after shedding and subtracting that value from the load just before shedding. The magnitude of the load to be reconnected could be provided by an approximate formula or "lookup" table which would relate to the initial value shed and the "off" time.

Additional constraints can also be inserted at the very end of the time period to limit the amount of load reconnected.

The more useful information with which the controller can be provided on which to base its actions, the more useful will it be in catering for a peak load situation.

The cost of any maximum demand controller should be weighed very carefully against the capability that it provides, and additional capital outlay at the time of ordering may well be compensated for by improved performance.

RECENT DEVELOPMENTS IN THE FIELD OF RIPPLE CONTROL

Although basic ripple control equipment has been available for many years, I would like to give you an indication of the developments that have taken place in the last few years, both regarding technology and application requirements.

As a result of the changing nature of loads and of the increase in network complexity in Europe, it became necessary to lower the control frequencies on the basis that the closer one can get to 50 cycles, the better the transmission of the control signals in the network will be. With this in mind, and being aware of the problems of adjacent system interaction, the German equivalent of the AMEU has drawn up a table of recommended frequencies.

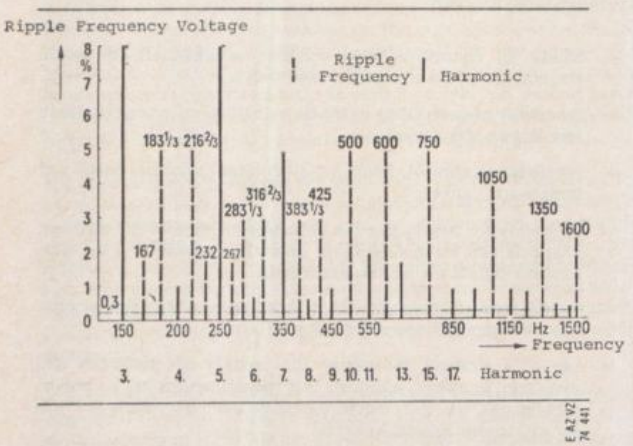
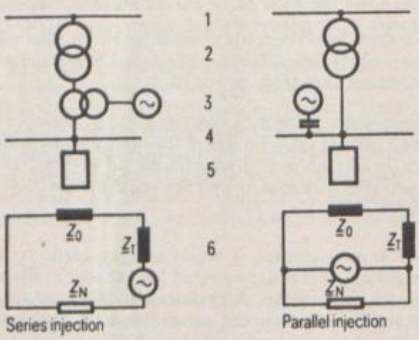


FIGURE 1
VDEW Frequency Plan

For the largest networks the recommended frequencies between 150 and 250 Hz would be chosen, and for the smaller networks between 250 and 450 Hz.

There are two methods of injecting the ripple tone into the 50 cycle network. The first is by condenser coupling onto a busbar, and is known as parallel injection. The second is by means of transformer coupling between the power transformer secondary and the busbar, and is known as series coupling.

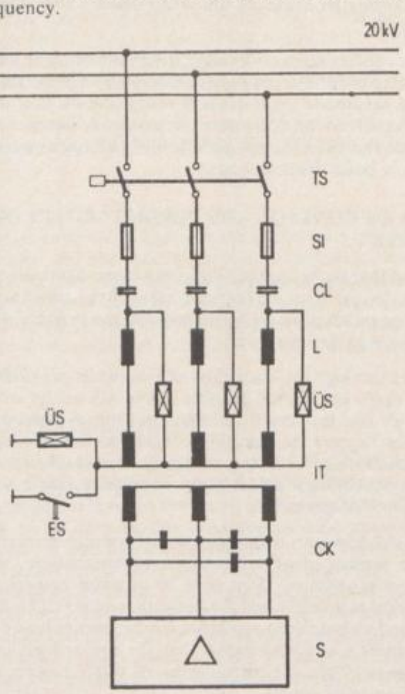
These two methods are shown on Figure 2.



1 High-voltage network
2 Transformers
3 Ripple control transmitters
4 Controlled network
5 Controlled network load
6 Equivalent circuits
$\underline{Z}_0$ Impedance of the high-voltage network
$\underline{Z}_T$ Impedance of the transformer
$\underline{Z}_N$ Impedance of the controlled network

FIGURE 2
Types of ripple control injection and their equivalent circuits

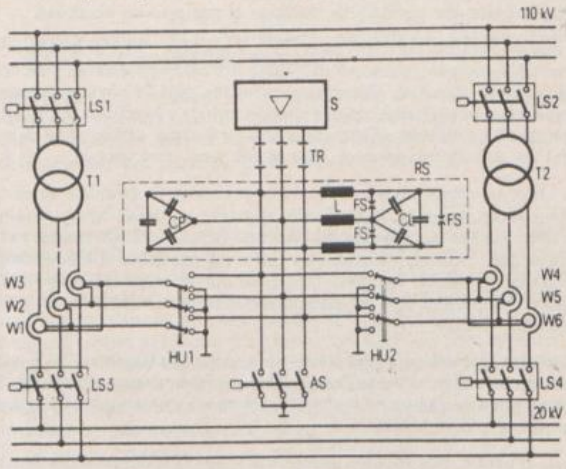
With parallel injection, Zt and ZO must be as high as possible compared to ZN, and this requires a high transformer reactance and the highest possible frequency to give maximum energy transfer into the load ZN. On the other hand, with series injection ZT and ZO must be as low as possible, which means a low transformer reactance and the lowest possible frequency.



CL Series capacitance
CK Compensation capacitance
ES Earthing switch
IT Isolating transformer
L Inductance
S Audio-frequency transmitter
SI Fuse
TS Isolating switch
ÜS Surge diverter

FIGURE 3
Audio-frequency coupling to a primary-distribution network by parallel injection

It should be noted that with parallel injection all the equipment as far back as the secondary of the isolating transformer must have the same insulation capability as the 50 Hz busbar.

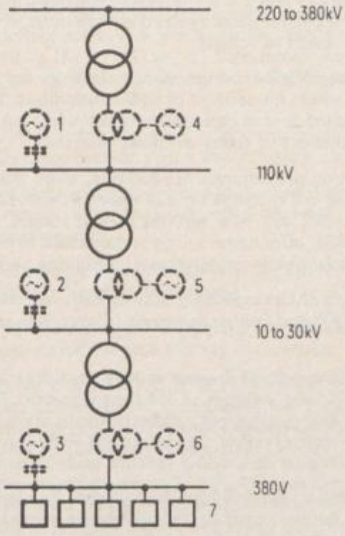


AS Contactor
CL Series capacitance
CP Parallel capacitance
FS Spark-gap
HU Knife-type changeover switch
L Inductance
LS Circuit-breaker
RS Resonant shunt
S Audio-frequency transmitter
T Power transformer
TR Isolating blades
W Injection transformer

FIGURE 4
Audio-frequency coupling to a primary-distribution network by series injection

With series injection the isolation takes place at the injection transformer and all the other equipment may have a maximum voltage of 1 000 V . A series of resonant circuit comprising inductances L and capacitance CL provide a low resistance load to the 50 cycles appearing on the secondary of the injection transformers. Condenser CP will reduce the harmonic output of the ripple frequency into the 50 Hz network.

The next question that arises is — at what point should one inject?



1 to 3 Parallel injection
4 to 6 Series injection
7 Ripple control receiver

FIGURE 5
Injection levels for audio-frequency ripple control

It is possible to inject at any level between 100 kV and 380 V . However, when considering the power handling capability of the ripple injection equipment and the voltage withstand requirements, the practical range is reduced to 11—33 kV, with injection taking place only in exceptional circumstances at 380 V or 110 kV . As a first approximation, the maximum ripple power to be injected can be taken as 0,1% of the network power and transmitters are available up to 60 kVA. Where a number of injection points are required in a network, the transmitters can either operate independently under the control of individual crystal oscillators or, if the network requires it, the transmitters may be phase-locked from a central point.

The ripple control receiver is, from the undertaking's point of view, far more important than the injection equipment, as it will be housed in the consumer's premises and must represent the ultimate in quality and reliability. The receiver consists of the following sections:

- The input section which is usually a double-tuned circuit.
- Band-pass filter for processing the pulses.
- A mains unit with pulse generator whereby the 50 Hz is used as a synchronising signal.
- Decoder and programming unit.
- Connection panel and output relay.

The receiver should employ the latest low current solid state technology. The units should not require any maintenance during their service life which should be independent of the number of transmissions made.

The receiver should have a voltage withstand capability of 2 kV at 50 Hz and a 7 kV impulse at 1,2/50 microseconds.

MNR. P. J. BOTES, President:

Ons is bevoorreg om 'n hoë besoeker van Amerika hier te hê. Hy is mnr. Sep van der Linden — u is reg, hy is 'n boerseun uit Vryburg se wêreld.

He left South Africa in 1957 and studied in Canada. He spent 13 years with Worthington Corporation, specialising in fluid and turbo machinery.

He then travelled extensively before settling down in the United States of America.

He is the author of several technical papers and a contributor of many articles related to power plants, etc.

He is married with 3 children, one American, one Canadian and one Australian.

His contribution to the paper by Mr. Barnard is on "Coping with the energy supply crunch — conservation and alternative energy systems."

MR. S. VAN DER LINDEN, Vice-President, Curtiss-Wright Power Systems.

The energy crunch is an International phenemenon, so that although the scale of Power Generation and Utilization is far greater in the U.S.A. and some other developed countries, the problems facing individual Utilities and Municipalities are similar around the world.

With the signing of the National Energy Act, November of 1978, the United States for the first time in its history had a statute that could be regarded as a National Energy Policy.

There is some general agreement that the Bill will accomplish less than what had been intended, especially with reports that for the next few years the United States may have a "glut" of natural gas. Several reasons could be cited —

(1) higher prices will bring previously "shut in" supplies to the market;
(2) higher prices will encourage new exploration; and
(3) new finds in Canada and Mexico offer prospects of increased exports to the U.S.

Any policy of this kind is bound to be complex and measures to achieve one goal may bring about conditions that will thwart accomplishments of other objectives. Broadly speaking, there are some new directions and initiatives chartered in the Bill for local public power systems.

- The primary emphasis is on energy conservation, and larger electic utilities (750 M + Kwh annual sales), will be required to perform certain conservation practices and provide various conservation services for their consumers.
- State governments — through their public utility commissions — are required to draw up conservation programmes for submission to the Department of Energy.
- The Bill requires the large utilities (500 M Kwh annual sales) to consider 11 different rate-making standards or policies, such as time-of-day rates, seasonal rates, interruptible rates, and prohibition on declining block rates that are not cost justified. For the first time the Federal Government will set standards that publicly owned utilities must follow in their consideration of certain retail rate concepts.
- Another significant innovation in the Bill, insofar as ratemaking is concerned is that utilities will be required to pay legal and witness expenses of consumer intervenors.
- The Bill places peacetime restrictions on the use of certain fuels — oil and natural gas — by utilities and large industries, which undoubtedly will have a long range effect on the fuel use patterns, and the switch to fuels that utilities are unaccustomed to burning will certainly increase electric energy costs.
- The Bill's emphasis on energy conservation should point up the importance of pooling and wheeling as an effective way of achieving greater conservation and more efficiency.
- Although many provisions will be dificult to administer, and greatly complicate the lives of utility officials, it will inevitably open up more dialogue between utilities and consumers.
- Alex Radin, Executive Director of the American Public Power Association makes this observation. "I believe that it is not good public policy to embody in legislation minutia that can only be changed by subsequent Acts of Congress, as Congress has assumed responsibilities that were performed previously by Executive Department Agencies."

However recent Congressional practice of spelling out procedures in far greater detail than was done in the past, maybe a trend due in large to the increasing complexity of our society, the distrust of government engendered by Watergate and other recent events. Nevertheless, the Act is clearly a very significant portion of our total energy policy, and will have an important and far reaching impact on the price, use and availability of energy in the future.

It is nearly impossible to forecast what the National Energy Act will eventually mean for publicly owned electric systems. Broad areas of the legislation await concrete form from the Federal and State Agencies which are responsible for administering them.

Some specifics have direct and immediate impact on electric utility operations.

Federal Standards:

1. Cost of Service Pricing
2. Prohibition of Declining Block Rates
3. Time-of-Day Rates
4. Seasonal Rates
5. Interruptible Rates
6. Load Management Techniques

FERC Can Order Wheeling (Federal Energy Regulatory Commission)

Under the Act, FERC may order a utility to provide transmission services, if it finds that such an order would be in the public interest and would conserve a significant amount of energy.

Utility Competition Promoted

Continued competition will be urged between electric utilities without freezing present competition relationships.

Voluntary Pools Encouraged

In dealing with power pools it stopped short of requiring utilities to participate in power pools.

Energy Conservation Emphasized

From its inception, the National Energy Act emphasized the role which conservation must play in any solution. The Bill was designed to require utilities to inform their customers about residential energy conservation, help customers secure loans for the costs of installation of such measures, and finally to supply the customers with lists of lenders, suppliers and contractors who can provide the necessary services.

The conservation measures outlined include such items as insulation, weather stripping, storm doors and windows, furnace efficiency devices, clock thermostats, load management devices, and wind and solar devices, and additional measures that may be identified in the future.

Coal Conversion Rules

The final portion of the National Energy Act having a very direct impact is the Coal Conversion Bill. The coal conversion programme applies to electric power plants which as single units have inputs of 100 million Btu/hr (10 MW) or combination of units with input of 250 million Btu/hr (25 MW).

New electric plants may not use natural gas or oil as a primary service and existing facilities will have a total ban of natural gas after 1990. Until that date, the existing plant may not increase usage of gas or oil consumed from 1974 to 1976 and none may switch to natural gas if none was used in 1977.

One thing is clear, the National Energy Act is only the beginning of a long process of planning for our energy needs.

SUPPLY AUTHORITIES

It may be of some help to understand the complexity of power generation and distribution in the U.S.A.

1. Federal Power Systems
   Tennessee Valley Authority and Bonneville Power Authority
2. Public Utilities
   Municipal owned electric utilities.
3. Private Utilities
   Investor owned electric utilities.

1. The Federal Power programme was mainly related to hydro-electric facilities (Corp. of Engineers and Bureau of Reclamation). When T.V.A. began to build steam generating plant, private power companies regarded the Federal Power programme as a threat to "free enterprise", however that debate of the 40's and 50's has died down. T.V.A. has used self financing for new steam generating facilities. Federal Power systems have a generating capacity of about 48 000 MW and supply all or a portion of 521 local public power systems and 279 rural electric co-operatives.

   Two fundamental tenets of this programme have been (1) that Federal Power should be marketed at rates as low as possible, consistent with repayment of Federal investment, (2) that Municipality owned electric utilities, other public agencies and rural electric co-operatives obtain preference in the marketing of Federal power.

   There is pressure from environmental spokesmen who want to increase rates as a way of discouraging consumption.

2. Public Utilities vary in make up, some as small as a few megawatts, others as large as some investor owned utilities and some who only distribute and add no generation.

3. Private or Investor owned utilities such as Duke Power for example have a 13000 MA system and have been the pace setters for the most efficiently run power plants in the U.S.

CONSERVATION PROGRAMMES

This title might suggest different aspects to different people. It might best be described as finding ways of better balancing the interests of conservation and environmental protection with those of providing essential economic needs of society.

The roots of conservation movement go back as far as Theodore Roosevelt's days where his concept of conservation was the wise use of resources. He wanted to stop exploitation of resources but not their use. Many environmentalists of today overlook that fact.

Energy conservation programmes are growing, more than 90% of the systems questioned in a recent American Public Power Association survey showed that 81% are now offering free literature and planning assistance, while 62% offer home energy audits, about half provide commercial or industrial energy management consulting services.

Approximately half of all responding utilities have had rate increases of over 50% since 1970 and further increases of over 30% are anticipated by 1980.

The urgency to look inward for our energy resources has brought a renewed interest in the concept of load management. Through load management, the real or apparent pattern of electricity use is altered to achieve energy conservation or improved efficiency, by time-differentiated pricing or controlling specific loads directly.

Maybe it is important to define load management by what it is **not.** For example, it does not mean penalty or prohibitive pricing, or denial of service because of some bureaucrat's arbitrary notion of some "desirable" growth rate in peak demand or some "permissable" amount of new plant construction. Further, it does not mean a degradation in service reliability or system safety. And finally, it does not mean an unwanted intrusion in the way people use electricity to enrich their lives.

Which load management strategy provides the proper balance must somehow be decided by utility managers, as the dynamics for one area may not be the answer for another. In fact, literally dozens if not hundreds of load management approaches have been tried. Whether any or all are "solutions" remains to be seen.

One or two might be worthy of mention. (1) Energy Storage — the most popular type of heat storage device is a system already in use in Europe. An insulated box in each home contains ceramic bricks heated to 1 200/1 400 degrees F during the night time or other off-peak hours. Air is drawn through the unit mixed with room air for day time winter heating. (2) Solar-Assisted Heat Pump — heating and cooling system. Demonstration units in the Lincoln Electric System, Nebraska, have demonstrated (a) the technical and economical feasibility of managing the peak power load during the air conditioning season (b) a practical, low cost solar collecting heating and air conditioning system available for most new and many existing homes (c) an all electric house designed to conserve electricity during summer peak demand periods. The storage medium for heating or cooling is water. (3) Utility in-house energy management. Hibbing Public Utilities Commission saved 88 000 dollars in purchase costs by maintaining their peak demand of 20 640 kW. Each kW of demand during peak saved more than 69 dollars per year. They achieved this by reducing loads in their plant on ID and FD fans, well pumps, etc. plus improvement in system load factor. (4) Peaking Power Plant — Small Municipalities satisfy their communities electrical needs in the most cost efficient means by purchasing base load power. The superintendent of utilities of a small town, Lola in Kansas (population 7 200) felt that buying power to meet peaking requirements would be like paying rent. No matter how much he paid each month, he never would be able to claim ownership, nor recover any capital investment.

The peak period extends over a 10 week period — late June to early September — for a total of 400 hours. Peak demand for the small town has reached 16 500 kW (new industrial expansion and local growth), and with demand rates of 2 dollars/kW plus 6 mills per kWh the utility installed 4 x 2 750 kW peak units over several years, enabling him to hold down the cost of electric service to his customers e.g. 2,1c per kWh[3] for residential customers.

ALTERNATIVE ENERGY SYSTEMS

There are many alternative energy systems under study such as Solar (Wind — Waves — Ocean Thermal Currents, etc.) Geo thermal — Bio Mass — Fuel Cells — Organic Rankine Cycles — Coal Fired Combustion Turbines — Coal Burning Diesels — Low Head Hydro-Electric Plants, etc.

The following comments might be of interest:

Solar Energy systems are technically feasible, and they have a promising future, their economics is uncertain, and solar systems do not integrate well with present electric delivery systems. This will change over time — my guess is between 5 and 10 years. Some utilities and consumers are pioneering the application and getting good results. The Santa Clara, California, Municipal system serves swimming pools, homes and a community centre.

The solar equipments fitted to homes are owned and serviced by the Solar Utility Division, and in exchange collects a monthly rental from 13 dollars to 17 dollars per month, per home. 80 swimming pools are solar heated, as well as the 27 000 sq. ft. Community Recreation Centre. Savings on solar utility payments are typically 20% to 30% less than natural gas to do the same job.

The type of solar system will depend on the cost of electric power supply and the difference between peak and off-peak demand costs.

- If the cost of electric supply is low and the cost variation large, a conventional system with load-controlled thermal storage may be preferred economically.
- If the cost of electric supply is high and the cost variation is small, a solar system may be most economical.
- If the cost of electric supply is high and cost variation is large, solar with load controlled thermal storage is desirable.

In considering the desirability of solar systems from the utility's standpoint, the future cost of supply and variability of cost for peak and off-peak power must be projected in order to identify the type of heating and cooling systems the utility would prefer in 5—10 years.

New Generation Technologies may offer significant savings to small utilities, as there are a number of compelling reasons why small utilities should consider developing generation, either independently or as part of a joint action project.

- There are financing and tax advantages over purchasing power.
- Purchased power costs are sky-rocketing.
- System reliability can be significantly improved if small utilities supply some of their own generation instead of relying entirely on purchased power.
- In some cases, installation of generation locally avoids transmission costs, including losses, etc.

The following types of advanced generation are being studied: four types of fuel cells, varying from 3—25 Mw, a 5 Mw coal-fired diesel engine, a 5 Mw coal-fired Sterling engine: a 2 Mw oil fired Sterling engine: a 2 Mw oil fired Sterling engine, a 1 Mw organic Rankine cycle bottoming a 5 Mw diesel engine and a 1 Mw two phase engine bottoming on a 5 Mw diesel engine. Table 1 shows the characteristics of the study as supplied by E.P.R.I. All these technologies are potentially available commercially in the 1980's.

Curtiss-Wright is working on larger modules of 50 Mw using coal as fuel in Pressure Fluidized Bed Combustion Turbines. The prime advantages is burning coal cleanly, efficiently and with very low water requirements. The basic 50 Mw module can be applied to repowering of older steam systems, while increasing the output and efficiency of the total plant, e.g. One 50 Mw P.F.B. combustion turbine will repower 15 Mw of steam system with an overall efficiency of over 40%.

Combustion Gas Turbine Utilization

Combustion gas turbines have played a very important part in the production of electric power and the development of utilities system. The U.S. electric utilities have about 52 000 Mw installed, or about 10% of the total installed U.S. capacity. Worldwide sales are still averaging about 12 000 Mw per year over the last four years. The simple cycle combustion turbine today has a thermal efficiency of about 30%, with some of the advanced engines attaining about 35%. Although the achievement of such goals by a simple cycle system are admirable, the operating cost when consuming expensive liquid hydrocarbons or gaseous fuels are quite substantial.

The simple cycle turbine has been historically accepted as peak load generating systems, and have in many cases acted as base-load or mid-range stations where utilities were caught short of capacity or due to delays in building large thermal fossil or nuclear power plants.

When utilities plan power generation capability, they must include the capacity to meet peak demand. However, it is difficult to build economics into a system considering the annual utilization factor as depicted in Figure 1. Peaking standby or reserve capacity are in operation for only short periods of time, making the combustion turbine highly compatible in the cyclical operation.

The combustion turbine offers unusual flexibility, as pre-engineered and packaged power plants that can be manufactured in a variety of sizes, and sjipped relatively quickly. Further flexibility lies in the basic design, in that they are readily acceptable to work in concert with other equipment — in combined cycle systems, repowering of older plant or co-generation systems with adjacent industries to provide not only peak but intermediate and base load service as well. The energy crunch is bringing more and more of these systems into consideration, simply because the availability fuels can be utilized more efficiently.

Notwithstanding the above conditions, both small and large utilities justify the economics of simple cycle combustion turbines for 50 to 300 hours a year operation to meet peak loads rather than purchase peak demand from larger centralized systems. The economics of lowering peak demand and the flexibility of utilization i.e. availability, are self evident in the analysis of the system requirements.

The economics for different municipal systems will vary according to load duration curves as well as the Total Direct Electricity costs based on demand charge and unit charge. System cost curves can be synthesised by adding the gas turbine capital and running costs and then reducing the total by the lower import costs.

The economy of scale is also applicable to Gas Turbine power plant, however, smaller units such as 30 MW class should not be ruled out, as units can be added in smaller systems to match peak growth and are quite competitive in miltiples up to 4 units with larger units of up to 15 MW rating, especially as the smaller units are skid mounted, require only a compacted level surface or can be trailer mounted to serve different load points to meet security needs.

The following simplified cost considerations may be of assistance to those looking at the economics of meeting peak lopping with combustion gas turbine.

SIZE	R/kW INSTALLED	TOTAL COST	UTILIZATION	LOAD (AVG)	kWH
3.0 MW	R266	R 678 000	100 hrs.	2200 KW	220 000
25.0 MW	R145	R3 625 000	100 hrs.	16000 KW	1 600 000
50.0 MW	R120	R6 000 000	100 hrs.	36000 KW	3 600 000

ADVANCED TECHNOLOGY CHARACTERISTICS

Fuel Cell	Generation Type	Size (MW)	Fuel Type	Capital Costs (1975 $/kW)	Operation Maintenance (1975 $) Fixed ($/kW)	Variable (Mills/kWh)	Heat Rate (Btu/kWh)
Type I		5	Naphtha	250	.26	2.85	8,900
Type II		25	Oil //2	200	.26	2.85	7,300
Type III		10	Oil //2	250	.26	2.85	8,300
Type IV		5	Oil //2	200	.26	2.85	7,300
Other Technologies							
Organic Rankine Diesel		6	Oil //2	370	6.0	2.5	8,080
Two Phase Engine Diesel		6	Oil //2	320	6.0	2.5	8,440
Oil Fired Sterling Engine		2	Oil //2	290*	5.0	2.5	8,650
Coal Fired Sterling Engine		2	Coal	655*	5.0*	3.0*	9,220
Closed Cycle Comb. Turbine		5	Coal	400*	1.0*	5.0*	11,000
Coal Burning Diesel		5	Coal	570*	35.0*	4.0*	10,130

*Indicates highly preliminary figure.

The accrued savings* are based on typical simple cycle heat rates of 12 000 BTU/kW/HR (3024 KCAL) this represents 1 litre of distillate fuel for every 2.2 kW generated or 6c/kWh at 13,2c/litre. This costs is deducted from import demand and energy charges at current rates applicable in Johannesburg of R73/kWh.

Financing from revenue against supplier credit over a 5 year period, in the case of the 25 MW unit, the annual repayments are R1 134 107 for the first year decreasing to R952 857 for the second year and to R771 607 for the last three years. The accrued savings will therefore pay for the installation in four to five years.

ALTERNATIVE METODS OF MEETING PEAK DEMAND

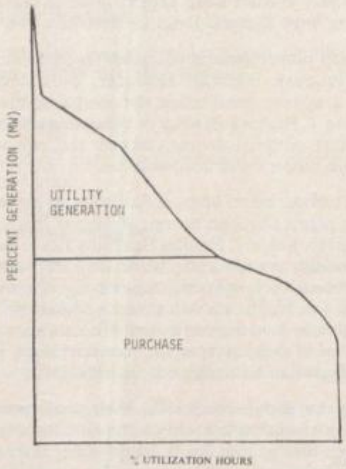
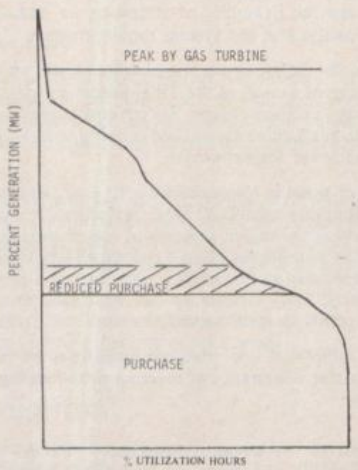


FIGURE 1



MR. E. G. DAVIES, Pietermaritzburg:

Recently my Council requested me to prepare a memorandum on energy saving, a subject much in the public eye recently. I had considerable difficulty in persuading them that there is a difference between fuel saving and saving electricity. While fuel saving should be encouraged, saving electricity other than that at peak periods does not appear to me to be warranted, since generation of electrical energy from coal in South Africa is probably as cheap as anywhere in the world, and coal supply is sufficient for at least 150 years, certainly in my opinion the usage of electricity should be encouraged and not restricted until such time, of course, as an alternative cheap form of energy is available.

The whole point about electricity supply is that approximately two-thirds of the cost to a municipality is the demand charge which, in my opinion, has resulted from high interest charges and other financial considerations. In Mr. Barnard's paper it is noted that the peak demand in both summer and winter in Johannesburg occurs at 8/9 o'clock in the morning. From discussions I have had with Escom officials this is the approximate time of the Escom overall peak. In Pietermaritzburg the system peak occurs at 8.30 a.m. for four months of the year, at 4.30 p.m. for four months of the year and at 6 p.m. for the remaining four months and, from discussion that I have had with other smaller municipalities, it is obvious that their peak occurs at 6 p.m. basically because their load is predominantly domestic.

We now have the situation that these municipalities, in order to reduce their demand costs to Escom for electricity, are installing at great cost load-shedding equipment which, although this equipment provides them with some relief on demand charges, does not contribute to an overall National saving because ultimately tariffs are adjusted to the detriment of all concerned. Perhaps there is a case here for more flexible Escom tariffs.

Referring to Paper I on the question of power factor, we recently had a considerable reduction in income because to bulk consumers installed this equipment. The reason for this is that the Council makes a considerable profit because of the diversity between these consumers, which is proportionately reduced when demand is reduced as a result of P.F. correction.

I agree with Mr. Barnard when he says that control of consumers' peak load can be carried out by limiting the size of the consumer's main breakers or switching out storage water heaters when the load exceeds a predetermined level. This calls for no expensive apparatus. I also agree that there are disadvantages to this. However, the alternative of reducing demand by disconnecting deferable loads during peak periods, i.e. ripple control, has in my opinion become so expensive that serious consideration should be given to the use of a circuit-breaker tariff. For instance, in Pietermaritzburg in 1963 we purchased audio frequency relays at a price of R16 each. The present price is somewhat more than R100 each. If a Council has a sharp 6 o'clock peak, purchase of this equipment is still in my opinion economic. If, however, a peak varies as it does in Pietermaritzburg, their use is probably only marginally economic, so the circuit-breaker tariff, which is easy to implement and not expensive although not technically as desirable, becomes in my opinion essential.

Pietermaritzburg has recently been investigating a pumped storage scheme of 20 MVA capacity, the cost of which is expected to be in the order of R10 000 000. With the present Escom tariffs, this scheme is marginally economic. If, however, larger schemes were to be implemented by, say Durban, then, since the Natal region of Escom has to operate at neither a profit nor a loss and since its income from municipalities would be less, it could be expected that there would be a general increase in demand charges so that, although individual municipalities may consider that such a scheme is economic as far as they are concerned, it is unlikely that they would be if this factor were taken into account. Here again some revision in the thinking of the tariffs designed by Escom appears desirable.

Section 6 of Mr. Barnard's paper refers to solar energy and, in this regard, I would refer to a paper by Professor R. K. Dutkiewicz and Dr. K. F. Bennett of the Energy Research Institute at U.C.T., in the Architect and Builder, in August 1978.

This paper considers, inter alia, the tariffs and potential inputs to solar heating in various areas of the country and, whilst no doubt there have been recent changes, I quote from that paper as follows:

> "The results of the calculations show that it is uneconomic to install solar collectors on existing houses except in Cape Town, Port Elizabeth and marginally in Pretoria. However solar collectors in new houses are economic in most parts of the country with the exception of Johannesburg, Durban, Edenvale and Germiston are marginl cases.
>
> In Durban and Pretoria the decision is influenced by the overall monthly electricity consumption since there is a large step in a graded tariff structure. However, it has been assumed that the average household uses between 600 and 1 000 kWh/month for this summary."

These results are derived mainly from the energy charge so that, if tariffs are designed to encourage solar heating, the cost per kWh or the cost per kWh on the last block should be kept high. If these charges are kept below about 2c per kWh then the use of solar heating is not economic. If, however, there is a drop in the interest rates the position could alter drastically. agree entirely with mr. Barnard that an electricity department should not be placed in the position that it should supply cheap electricity for topping up solar heaters and thereby lose a considerable revenue from a service which could be provided very cheaply during off-peak periods.

The paper by Mr. Marloth sets out clearly the mathematics of load shedding and the figures he quotes line up very closely with those obtaining in Pietermaritzburg for similar load-shedding equipment. One of the most difficult tasks is to determine what the setting of the system demand should be for a particular month. As Mr. Marloth states, apart from there existing a probable peak for each month together with the probable range, it is also necessary to forecast a target value which will yield the maximum peak reduction with a minimum probability of causing inconvenience. In practice, the target is set low and gradually moved up during the month. It would take a brave forecaster to rely heavily on probability because, if the probability did not eventuate, the cost would be substantial.

It is estimated that if all consumers in Pietermaritzburg were covered by ripple control and if in one month the peak was not reduced by correct forecasting the loss could be over R100 000.

MR. J. G. BRUMMER, Stellenbosch:

Mr. President, allow me to congratulate Messrs. Barnard and Marloth on well prepared and ably presented papers.

Mr. Barnard put the planned use of resources very neatly into perspective as far as local authorities are concerned and, inter alia, mentioned the fact that the installation of small pumped storage schemes is worthy o consideration.

I might mention that Stellenbosch has already carried out a preliminary study in collaboration with the University of Stellenbosch to determine the viability of such a scheme.

Because of the unusual flatness of the load curve and the relatively limited water supply sources during the height of the summer season at our disposal at present and, short of having to resort to very expensive civil engineering schemes, we found that only about 1,5 MVA could readily be clipped off our daily peak demand. This amount may seem to be insignificant, but it can be proved that a constant reduction of 1 MVA in monthly kVA demand will justify a capital expenditure in plant of R390 000,00. Taking current interest rates and the existing Escom tariff into account.

As far as Mr. Marloth's paper is concerned, I wish to point out that the control methods proposed, do not appear to offer a satisfactory solution when a very flat load curve is encountered.

The solution that I venture to suggest would be to switch the storage devices off for virtually the whole day, if required, and then to supplement shortfall in heating requirements by means of solar heating devices. Naturally, the electricity tariff will have to be so designed as to provide the necessary encouragement to consumers to install solar heaters in order to eliminate possible inconvenience due to loss of heating.

MR. J. QUINN — Affiliate:

* Mr. Barnard and Mr. Marloth have produced a most comprehensive and interesting review, which will undoubtedly be extensively used as a reference for utilities in South Africa considering the introduction of load management into their electrical systems.
* There is a definite need for sound load management policies in the future as these not only ensure maximum utilisation of existing generation but would allow for part of capital accrued from deferred system expansion to be channelled into consolidation of established distribution networks with a view to eliminating those unmanaged supply interruptions.
* Where scope exists for peak levelling, the economics normally favour deferred utilisation for domestic consumers and standby generation for industrial or commercial consumers. This highlights the complexity of the load control problem facing engineers in the larger municipalities. It would be of interest to know what progress Johannesburg has made in establishing the load parameters for these various sectors.
* Many large industrial complexes are themselves looking into their existing management of their loads with a view to introducing similar systems for controlling loads within their own complexes.
* Practical implementation of domestic load control has been significantly altered in recent years by advances in semi-conductor technologies, and design improvements in mains signalling equipment (1). With such equipments it is now feasible to provide sophisticated peak levelling equipment for load centres rated around 5—10 MVA and this now makes load control an economic proposition for even the smallest municipal network.
* This has been achieved by the availability of economic mains signalling transmitters of unique design for connection to the L.V. side of standard distribution transformers. In addition such equipments avoid the need for extensive civil works previously associated with conventional audio-frequency ripple injection equipments. Equipments of this type have been PROVED IN SERVICE AND THERE IS ALREADY A WORKING INSTALLATION ON THE REEF.
* These developments favour the use of intelligent controllers operating a decentralised control strategy with the attendent advantages of quicker introduction of working equipment, early confirmation of load forecasts and simpler system expansion.
* The control strategy is embodied in the microprocessor firmware and the user can adopt either fixed programme or closed loop peak levelling routines to suit local requirements. If required, load parameters can be collated on a daily basis for despatch to a central scheduling station using standard telemetry or supervising control channels.
* Programmable equipments for outstations in the power system environment should be designed to embody immunity to severe network transients experienced in electrical substations, in compliance with IEC255-4.
* The authors have expressed a desire for decentralised area or group control and their views on the use of computers in this mode of operation would be of interest.

(1) IEE PROC VOL. 125 NO. 4 APRIL 1978

COUNCILLOR J. CIVIN, Bedfordview:

Mr. President, on behalf of Councillors I'd like to congratulate both you and your new Deputy on your elections.

Mr. President, my contribution is more of a question. We have a system in Bedfordview where we have two-part metering in our better class residential area. Presently, when demand necessitates it we have basis load shedding. Now, is it possible to have load shedding on a voluntary basis? In other words, at times of system peak demand, the consumers could choose either to accept load shedding or to pay the demand charge of a two-part tariff. At other times the consumers would enjoy the benefit of cheap electricity. There would have to be some form of signalling in the house to indicate to the consumer that his demand meter is working. This could be capital-free because, being a voluntary item, the consumer would have to pay for installation himself. He would be getting the benefit.

Following on what the City Electrical Engineer of Maritzburg said, maybe we could persuade Escom to do the same with us as individual consumers of Escom.

MR. A. H. L. FORTMANN, Boksburg:

Mr. President, with regard to Part I of the Paper, "The Planned Use of Resources", by Messrs. Barnard and Marloth, I have a comment to make and one or two questions to ask.

Firstly — under Section 3 on page 6, the following sentence appears:

> "To take advantage of load diversity, it is desirable that feeders supply a mixed load."

I agree fully with this statement, but in practice this is very seldom achieved, especially with distribution feeders supplying either purely residential areas, or industrial consumers, or possibly commercial concerns.

Referring to the same section on page 7, I would like to ask if a Supply Authority is in fact liable for claims arising out of damage caused by excessive voltage reduction, bearing in mind of course that in this instance the low voltage was a deliverate act.

In connection with Section 7 "Emergency Generating Plant", on page 17, item 4, could Mr. Barnard explain the statement "The Supply Authority has neither the means, nor the authority to remotely start up the plant in order to feed into the system during a system emergency."

Thank you Mr. President.

MNR. K. J. KING, Roodepoort:

Mr. President, I would just like to report that we at Roodepoort have experienced a lot of difficulties that Mr. Marloth has foreseen, and in the foyer we have displayed charts presenting some of the results of our own load-shedding programmes which clearly underline the pitfalls that one can easily fall into.

Mr. Marloth is to be congratulated on ably presenting these to us in a form that we can use for our own programmes.

Thank you Mr. President.

MR. A. J. LEVY, ESCOM:

In his excellent paper Mr. Barnard has drawn attention to the necessity for reducing waste of electrical energy and has pointed out the benefits to be obtained by cutting short-term peak demands and thus improving the utilisation of generation and distribution resources. These objectives are so obviously correct that they require no comment. Escom's present tariff levels are such that they undoubtedly discourage waste. The parge power user tariffs are also structured to provide significant incentives for improving load factor.

Mr. President I have prepared some notes dealing with Mr. Barnard's paper, but I think I'd like to deal now more particularly with the comments that have been made on tariff structures and so forth. My first comments deal primarily with mr. Barnard's paper.

In assessing the financial benefit to be obtained by reducing demand a municipality will normally compare the costs associated with peak-lopping devices with the reduction in charges for maximum demand. Where loads can be deferred by ripple control at relatively low capital cost, this procedure is undoubtedly correct. But where it appears to a municipality that it may be able to reduce its own costs by installing peaking generating plant, the decision is not so simple and the following considerations should be borne in mind:

(1) The installation of any further peaking plant relying on imported fuel such as gas turbines or diesel generation should be avoided if at all possible, even if at first sight it appears that it may be economically desirable.

(2) The capital cost per kW of installed capacity tends to be higher for the installations that would be considered by a municipality than for the much larger installations that would be installed by Escom. The steps being taken to meet the current oil crisis, such as the construction of Sasol III following immediately on the completion of Sasol II, have highlighted a new restraint that must be observed in the construction of all capital-intensive projects, namely the restrictive effect of the limited capital available in South Africa. This has been referred to repeatedly in recent Government statements and may become even more important in the critical years that lie ahead.

(3) The limited pure hydro generation available in South Africa can be economically exploited for peaking purposes if developed on a large scale, e.g. Orange River Project. The possibility of large-scale development of this form of generation using renewable energy would be reduced if the peak demand of the national system were to be met by a number of smaller installations using non-renewable energy.

(4) The disadvantages associated with the installation of emergency plant by individual consumers on a municipal system mentioned by Mr. Barnard also apply to a lesser extent to the installation of peaking plant by municipalities when related to the national system.

It is often stated that the tariff should contain a message to enable a consumer to make the correct decision without outside constraints. This is not always practicable and is, in any case, not applicable when the decision is influenced, not only by a comparison of operating costs, but also by possible shortage of future availability of resources such as important fuel or capital.

Mr. Barnard has mentioned the use of underfrequency load shedding as a means of controlling load in an emergency. The scheme of voluntary load shedding by consumers introduced by Escom is not intended to reduce the risk of a nation-wide blackout but to permit consumers to drop non-essential load to avoid the risk of a complete loss of supply resulting from underfrequency shedding of blocks of load by Escom. The response to Escom's request from the mining industry in particular and from industry has been very gratifying and the steps Johannesburg is taking are noted with appreciation. In 1977 Escom had itself to shed blocks of load on underfrequency on four occasions to safeguard its system but in 1978 this was not necessary at all although it is known that load was shed voluntarily by consumers on numerous occasions.

Mr. Palser made a lot of comments on Escom's tariffs. Unfortunately, I didn't see these comments before presentation otherwise I could have replied to them much more competently and fully.

His main complaint was that Escom's tariff does not convey the message that it should convey to enable decisions to be taken. Other comment made in a similar vein was that our tariffs should be time-of-day tariffs and it was mentioned that some municipalities have peaks at 6 o'clock in the evenings, others have morning peaks. This diversity between the peaks of the various municipal consumers all contributes to an exceptionally high load factor on the Escom total system.

I think that it is generally known that our annual load factor is of the order of 76%. What is'nt known so well is that our weekday daily load factor is in excess of 90%. The suggestion that has been made that we should have time-of-day day tariffs, implies time-of-day demand charges.

Within any useful period of time for which these could be considered, our demand is virtually flat, and there could be little differentiation. But if we are to talk about special terms to match the special characteristics of consumers, we must also bear in mind seasonal tariffs. Two-thirds of our load is made up of industrial supply and mining supply which have no seasonal variation to speak of. One-third of the load, in round figures, is municipal supply which has a considerable seasonal variation. Municipalities are not penalised for that, but it is possibly something that will have to be borne in mind.

Mr. Palser mentioned that Escom's consumers are required to notify demand three years in advance, and with this knowledge Escom should be able to plan accordingly.

The three year advance notification is really only for local distribution use to make sure that the transformers and so on are available. In our long term planning for generation expansion or for major transmission, the lead time is six years on a power station if it is in the process of being constructed, and more than eight years for a new power station. So the three year planning has no significance in our major cost consideration which is generation.

I might also mention that the original intention was that these notifications should be genuine notifications of genuine expectations. They have tended to become formal notifications with excessively high figures to ensure that the supply is available up to that limit — they're not genuine notifications.

The overall effect of all of this is that although municipalities have taken steps to improve their load factors through he installation of ripple control, and this has undoubtedly paid off, the effect on the Escom system has been negligible. Our load factor over quite a number of years past has not been affected in any way, it remains very, very constant.

This shows that this diversity effect has now almost reached an optimum figure.

One last point is in connection with solar water heating. I think the tendency when attempting to assess the economics of solar water heating, is to compare the saving in kilowatthours at the domestic tariff with the cost of the installation and then to decide whether its going to pay or not.

If solar water heating were to be introduced on a large scale, it would need a very careful and difficult analysis to assess the effects of the demand which would be imposed on the system at the time when the total system demand is already high.

If the water heating contains no backup electrical hating, in other words, it runs entirely on solar energy, there is no problem. The problem arises when there is an electric heating element to assist when the weather conditions are against you.

On that basis it may be found that the real economics of solar water heating are not so favourable.

This also is possibly one of the tariff messages that Mr. Palser would like to consider that he should give to his consumers contemplating the installation of solar heating in his domestic tariff.

MR. B. ANDERSON, Motorola:

Thank you Mr. President, Gentlemen — I'd like to speak very briefly on radios and meand of load management.

The ripple control system is well known to everyone and the 50 hertz method is also new on the market. Radio control provides a unique means of providing load control, a radio receiver installed in each home with a timer. When we address the radio receiver it has approximately five minutes where the timer will hold the geyser or the water heater out of circuit.

Now, the whole system is based on being a fail-safe system. If the system or anything were to fail after a four or five minute period, your timer is going to relax and you can have no cold water complaints on the system, which is an advantage.

In this system one controller will control the whole municipal distribution system, because if extra signal saturation is required, additional repeaters would suffice and no extra generation plants required.

In this system all the timing is on the radio switches, and the time period is purposely made very random, so that when, after a group of relays have been addressed and they do return — they return softly, each of them with a very random return period, so there is no sudden surge when the geysers are returned to the system.

An additional feature is that if there is a distribution feeder outage and all those particular sections are out of circuit, the load picks up, all the radio switches will be operating initially to five minutes without radio control This provides the feature that you have five minutes in which to set up a programme if required, to reduce that load.

Allocations by the G.P.O. have allowed 12½ kilohertz channels for the radio application, and this will give approximately 150 odd channel capacity if required in a large system.

An additional feature of a radio channel is that you can use the same radio channel for other purposes such as tapchanging, streetlight control or any other control function which may be required.

Thank you Mr. President for allowing me these few remarks.

MR. W. BARNARD, Johannesburg:

Mr. President, Ladies and Gentlemen — Fortunately I have only a few questions to reply to.

The first was from Mr. Malan who asked my opinion about inconveniencing consumers through lack of hot water.

I have often heard people say that over the last number of years we have been living beyond our means, and that we are now paying the price. I agree with this philosophy and quite candidly I believe that we can no longer afford the luxury of demanding hot water 24 hours a day every day of the year, particularly if you take into account the usage of hot water in the average home, and I think that the time has arrived when people must realise that if they are going to demand that sort of luxury, it is not only going to be at a cost to themselves but it will be at a cost to the country in resources, and I think that the time has arrived when the public must accept the fact that on the odd occasion they must have a little inconvenience, if they are going to contribute substantially to achieving economy and conservation of energy.

The second point I'd like to deal with was raised by Mr. Palser. He and I seem to have fairly widely differencing views on the use of solar heating and the control of solar heating.

I am very much in favour of an overall integrated energy policy for domestic consumers. I cannot accept that if solar energy is used, say, to the extent of 10%, some other body must virtually manage that part of the energy programme.

Mr. Marloth, in his contribution, mentioned a number of problems that arise from shedding load by switching out water heaters. I think we have here the ideal opportunity of optimising both on shedding of load and eliminating as far as possible inconvenience arising from having to leave consumers off. I put it to you that if there is adequate storage capacity in a solar heater, you would probably be able to switch out the electrical element of the water heating system for far longer periods.

We have argued about and discussed for many years the use of instant water heaters; at one stage we were strongly opposed to the installation of any instant water heaters — we called them demand thieves and all sorts of things, and said it did'nt give us the facility of controlling stored energy. I should think we would be far more prepared to consider the wider use of instant water heaters if they had a storage element, supplemented by solar energy. To me this would make a beautiful package, of which 80% or 90% is electrical, and 10% is solar, and to say that the City Electrical Engineer must look after that 10% just doesn't ring true to me. I think its got to be an integrated scheme. I don't for one moment suggest that we are going to install solar heaters. I don't think the City Engineer is going to install them, but I think that we must get legislation for this and we must lay down the conditions and plan and devise an integrated system.

Mr. Marloth was very shocked when I said we might even insist that, at the same time as we put in our ripple control systems, the consumer must put in a solar water heater.

One would have to provide the right incentives for this, but to me it makes sense and I think it is the only way in which we can make a major impact on the problem and also make the optimum use of solar energy.

The other point which I'd like to touch on very briefly was raised by Mr. Kniel, when he listed, the order or merit of different peak demand control devices. He placed, I think, the ripple control system first, and then gas turbines.

I must just clarify one point as far as Johannesburg's whole philosophy is concerned, because I stated it rather badly and I think it was misunderstood.

I made the comment that ideally Escom should install gas turbines, but I said they should install them two blocks from the Carlton Centre and charge us the leasing cost and not the demand costs.

What I was in fact trying to imply here, was that we have gas turbines basically and primarily for emergency supplies and, therefore, for peak lopping purposes these become number one on the list, and we must use them to the minimum extent possible in order not to consume large amounts of fuel, but we've got to get a return on our capital investment. We cannot wait for the emergency which, it is hoped, will seldom arise but, nevertheless, we've got to have emergency plant, and while its there it must be considered first for reducing the peak.

I'm not quite sure of the question Mr. Fortman asked. He did refer to emergency plant and my comment that it was not under the control of the local authority. In fact, I was talking about those small generators profusely liferating about the country and certainly in Johannesburg, and personally I'm very strongly opposed to these, I think this is a proliferation of inefficient, uncontrolled, unco-ordinated generating facilities with every consumer putting in a little diesel generator in case Escom's supply should fail as it did on Tuesday night when their Chairman was without power. But I think the right thing is to strengthen the municipal system because, as I mentioned previously, if you are going to put in an emergency plant, and you want to get some return on it, and I think that it is essential to get return on capital invested, then you must have control of it over your peak period, which might not even coincide with the individual consumer's peak period. I cannot visualise that we can easily exercise an overall control over perhaps a hundred little diesel generators in the basements of all sorts of buildings and, quite candidly, there is no need for them. Certainly with the record that Johannesburg has for continuity of supply, there can be no justification for prolification of small generator assets.

I think what really gave rise to this conception in the past was that our Fire Regulations, which required that in certain circumstances (e.g. for lifts and fire-fighting services in high-rise buildings), emergency stand-by generating plant had to be provided. Now, our practice is that we will give a stand-by supply which will feed into an emergency switchboard, and this is accepted in terms of the Fire Regulations as meeting the requirements of the By-laws.

I think that I have mainly dealt with Mr. Levy's point about the use of peaking plant in Johannesburg, and that I have clarified that this is basically emergency plant, but he did also mention that we should not use peaking plant because of the fuel consumed, which is in short supply and costly. Here I would like to give the assurance that we are very aware of this and are actively looking at alternative sources of fuel.

In the long term, it is hoped, and I've had a number of discussions about this with Mr. van der Linden of Curtiss-Wright Corporation, that we will be able to use coal, but in the shorter term we hope that we might be able to make use of Sasol gas or ethenol, and so I think that we can solve this problem. In the meantime we have tried wherever possible to reduce the number of running hours. Last year we ran our plant fairly extensively, but this year we hope we will be running it not more than about 20 hours, so this is not a significant factor.

Thank you.

MR. G. R. MARLOTH, Johannesburg:

Mr. President, Ladies and Gentlemen — Looking at the discussions which I found very, very interesting, it became evident that the same, or similar points were being raised by several of the contributors and so I would like to deal with these on a general basis.

There was one specific question which I think is a real and immediate problem! Councillor Civin of Bedfordview asked whether there was a system which would permit the consumer to pay more when he wished to. I would just like to quote an example that's used in Switzerland as I understand it. Where the supply authority has a control device, the first contact of this device is used to control the kWH meter and changes the tariff from a low to a high tariff. Now then, as a service to the consumer, they have also provided a contact to disconnect storage heating loads for which the consumer would like to be supplied at low cost but, in the event that the consumer has abnormal conditions in his household, he is provided with an override switch so that he can, if he chooses, buy his energy for these devices at a higher cost. Then for emergencies a third contactor is provided which disconnects these loads regardless of the consumer's wishes. This system would appear to have the elements of meeting the problem that Councillor Civin had in mind.

Now, going on to the discussion of load control, I think the contributions yesterday highlighted the diversity of characteristics of load curves that could be encountered, and I think two extreme examples were quoted, one — Mr. Malan quoted the case where they had a very large but very short duration peak, and in this case it is possible to shed all the channels. This could even be done by using some form of programmed time switch, and this can normally be done without causing any great inconvenience to the consumers.

Mr. Brummer from Stellenbosch quoted the opposite — a flat curve, and of long duration, and in this case its not possible to shed all the load, but only a small proportion of it, but there is a requirement then for very, very precise control, and it is in this area where I think the whole question of optimum control comes into operation.

The situation one then has is that, if the control is not precise, this error is then measured at the end of each hour. That error results from the fact that unless the average value of the load is held exactly on the target value, then we get a situation where the load integral follows this dotted line on the chart and then we have an error at the end of every hour.

Now, it really is essential to use all the available energy when one has the system running all day. What is even more important is to get an equal contribution from all consumers, so one has to consider the problem of consumers with a relatively high demand for hot water, those with a low demand for hot water and those who correspond to the average demand for hot water, and it is also necessary to make sure that the energy that is supplied is supplied equally to all groups of consumers and that we don't have the situation where one consumer has more than he required and another one has possibly less than he requires.

Together with this is the question of setting the targets, and I think this is the major headache for most of the delegates here who operate this kind of system.

It is necessary to have some very important information, the first is — what would the load curve have been? It's necessary to get that information before one can really start deciding how much load reduction can be applied. This is a time consuming process if it's done manually, but it's worthwhile because it then becomes a possible measure as to what we are dealing with and to make some meaningful conclusions. It is also necessary to know what the hot water demand curve is.

One has to take into account at the time of the system peak what the hot water demand will be, will the duration of this demand be long or will it be short? It is necessary to know this sort of thing in order to set the target accurately.

Then there is the question of what is the effect on the consumer? Referring to the appropriate curve accompanying my paper, it was said that the reduction was value P, and you can see the temperature of the consumer's hot water depends on the square of this load reduction. It is very important to bear in mind that a small error here can lead to quite a large error in the degree of service we are offering.

The other point to note is that the duration of the load shedding is dependant on this relevant load reduction, and if we are to say that the consumer's inconvenience is dependent upon the lowest temperature reached and the time for which this lowest temperature persists, then you can say that it is getting around to being proportional to the cube of the load reduction.

There were also some questions about how one can go about forecasting the load in order to decide what the target should be. I would say at this stage that forecasting is very much an art, it is not really a precise science. There is an inherent uncertainty of the results, and it is necessary to quantify this uncertainty and try to see what the effect will be of a possible variation in temperature. So our objective is really, in the forecasting system, to follow an approach that minimises the uncertainty and makes it possible to get a better estimate of what the load will be.

In the past, when we had a steady growth rate, it was fairly adequate to compare the same month of the year with that of previous years, and so produce a line showing the growth. In the last few years with the economic recession, this has been totally inadequate; in some cases a negative growth rate has been experienced and this has just thrown this type of forecasting completely out of step.

Another method is to compare each month with the two preceding months and, by using the known peak load in these preceding months, to try and estimate what the peak load will be in the month for which we are preparing the forecast.

We have used this method quite successfully and we have never really been far out in our estimate of the target, and this is on a system which does not tolerate the approach of shedding all the channels over a peak.

That same approach can be taken one step further by creating a trend-line. Historically this would be the twelve months' moving average of the system peaks. The reason for taking twelve months is that this eliminates all seasonal influences.

The problem is then, how do we create the twelve months' moving average for a period of time which has not yet occurred, so the next stage in this approach is to calculate the ratio of each month in the year to the moving average. Now, when this is done, one develops an index, that for a summer month might be 0,7 times the value of the trend line, while for a winter month it might be 1,2 times the value of the trend line. So, by looking at the ratio applying to a given month for a number of years in the past, one can get an average value of the ratio and a measure of its uncertainty, and then it becomes possible, given a trend line, to calculate the forecast peak for any given month of the year.

This works in reverse as well, in that, given the peak value achieved in any given month of the year and by applying the index, we can see where the trend line will be at any stage. This method has stood us in very good stead over recent periods; the trend line proved to be a very sensitive indication of the recession; it also proved to be a very sensitive indication of the upswing that is now beginning to show and I think that, combined with the procedure of looking at previous months and comparing a given month with the two previous months, a fairly accurate forecast can be produced in the short term, and we are only looking a month ahead, so that if we wish to on the 1st of the month, we would be able to see where we are likely to be during the next 31 days.

Of course, having established the forecast value, then there is still the question of revising this forecast during the month, and this is where I think this type of frequency distribution comes in, because one can then say the number of days that we've had this month with load above a certain value corresponds to the line, or that it falls below this line, or it might be above that line, and that being the case one can then review the estimate for the peak, and say — yes, this month appears to be more severe than normal, or it appears to be milder than normal. So while we have not got a complete forecasting system, we certainly have the elements of one; we are developing it, but it does, of course depend on historical information, and I would certainly be very pleased to discuss the way this operates with anybody who is interested, either here or by correspondence.

The problem that we have with the controller is to reset the target to maintain predetermined parameters, if this forecast appears to be totally incorrect.

Now, I agree with Mr. Kniel that it is not easy to forecast exact values and in load control you are talking about the difference between two large values. You may be taking a small amount, say 10%, off the peak, and if the variation of the peak is 10%, then you might find that it is totally beyond the ability of the controller to operate properly. Alternatively reduction might be required, and the question then becomes, when looking forward, what could the controller do about this sort of thing. I agree that its not possible to take a computer and try to produce a forecast, using all the parameters which might affect the load. But I do think its possible to do something differently.

One can look at other things such as the number of channels which must be switchd off in order to obtain the required reduction, or more specifically, in order to meet the preset target. It is possible then to establish guide lines, such as we have, that 60% of the channels can be switched off but no more. When we get to a stage where we find that 90% of the channels are switched off, then it is time to try and raise the target in such a way we find ourselves getting back to the desired number of channels. It is also possible to have a look at the question of the maximum energy that is being deferred and, if the controller can keep track of this, then it can, using a parameter like this, be allowed to increase the target setting.

So, I think there is room, using precalculated values, to allow a controller some latitude is resetting its target.

The one point that really comes in here is that, once one has load control in operation, one can no longer measure one's peak. You can only measure the value that you decided should be met as a peak and, therefore, all forecasting systems would collapse at this stage because one is using data which is well and truly being cooked.

So it is necessary to add to your forecasting system some means of monitoring the number of channels shed and the amount of load shed each time these channels were disconnected, in order to estimate what the peak would have been.

There is also the question about the use of computers which is very much more in the forefront now. If one has an off-line computer to do forecasting, so much the better, but one can get quite a long way using an ordinary calculator.

It is also very desirable to use a simulation routine; Mr. Kniel made reference to one of these and I have seen results of the simulation routine. My impression is that, provided you have the time to do a number of simulation runs so that you can get a proper feel for the operation of your system, this gives one very valuable insight and it also does help to get some measure of the limitations to the amount of load control that can be applied.

Of course, the trouble is that the load curve is never quite the same as the one used for the simulation, and the controller then has to be able to handle the events as they occur.

When we get to the sort of load curve where we want precise control, then we find we need the ability to make a limited calculation and, instead of looking at the energy diagram for the target we want it to reach each and every hour with no error, this calculation of dividing the energy remaining by the time remaining is the capability that is required.

It is also necessary to make logical decisions, and the sort of logical decision you might make could be related to the question of the amount of load that is likely to come back, and how this relates to the amount of load that could be restored at this time in order to meet the calculated value. So, we might expect that a controller is needed that can store a table of this type in its memory and refer to it in order to decide what is the best moment to return the load. It would appear for this purpose that the micro-process is ideal. I think the micro-process has come of age; it has appeared in a large number of controllers and it has also demonstrated a quite considerable calculating capability. I think that it is just a matter of time before we see these micro-processor base controllers taking over this function. Of course if one has another system, like a tele-control system with its own mini-computer, then this could be installed in place of the mini-computer.

The other thing a micro-processor does in the same process is, of course, to calculate the after diversity demand which represents the hot water consumption. These curves as you can see, can differ from day to day; they can differ between days of the week, and between months of the year, and so one would like to establish something more definitive than a curve which is taken, say, once a year, or once every three

months, and a micro-processor is ideal for doing that and saving a tremendous amount of labour.

I think, when looking at that sort of curve, one has another point that is that if a neighbouring supply undertaking has just taken a curve, the chances are its curve would be very similar to the curve applying to one's own system, and I think that one thing that is really necessary, is that there should be more interchanges of this sort of information.

Those who are fortunate to have good data logging capability could provide a very useful service to the people in adjacent areas who do not have this, and where everybody has the ability to make some measurements, it is certainly a case of the sum that is very much more useful than the various parts.

So I would like to close by making a plea for some establishment which could exchange information on characteristics of systems which are controlling items like hot water heaters, bulk storage heaters, space storage heaters, etc.

All this sort of information I think, when thrown into a pool, would be very, very useful for other people who have not got their feet wet or people who are operating such a system but have not got the necessary information to make the best use of it.

MNR. P. J. BOTES, President:

Gentlemen, we are indeed indebted to Mr. Barnard for introducing to us the most important subject of Application of Load Management in Electricity Supply Undertakings.

In his onerous task as City Electrical Engineer of Johannesburg, he still managed to prepare a most thought provoking paper.

Mnr. Marloth wat gepraat het oor die "Dinamika van Lasbeheer" het eweneens 'n handleiding daargestel wat seker deur baie gebruikers en ornemende gebruikers van lasbeheertoerusting gebruik sal word. Mnr. Marloth het hierdie referaat onder moeilike omstandighede geskryf, op 'n tydstip toe sy dogtertjie ernstige nier-operasies moes ondergaan. Ons is besonder verheug dat dit beter gaan met haar en ons vertrou dat sy volkome sal herstel.

Namens die Vereniging wil ek graag aan u elk 'n das oorhandig, as blyk van ons waardering — mnr. Barnard en mnr. Marloth.

Dames en here, ek gaan hier 'n uitsondering maak. Ek wil graag aan die persone wat bygedra het tot hierdie verrigtinge en wat besondere werk gedoen het, veral mnr. Malan, wat feitlik 'n referaat geskryf het, en aan mnr. Palser elk 'n das oorhandig en dan wil ek ook graag aan ons oorsese besoekers wat bygedra het, mnre. Sep van der Linden en R. Kniel, elk 'n das oorhandig. Sal hulle asseblief na vore kom?

Dames en here, dit sluit dan die bespreking van hierdie referaat af.

Rld. Bennie van der Walt, Burgemeester van Roodepoort, verwelkom die gaste by die burgerlike onthaal wat deur die Stadsraad van Roodepoort aan die afgevaardigdes aangebied is.

CURRICULUM VITAE

Mr. Ken King graduated from the University of the Witwatersrand with a B.Sc. Degree in Electrical Engineering in 1967 and began his engineering career in 1967 in the Pretoria Works of Asea Electric; moved to Escom (1970—1974) and is presently Assistant City Electrical Engineer of Roodepoort.

TOESIGBEHEER VAN 'N ELEKTRISITEITSVOORSIENINGS-ONDERNEMING VAN MIDDELMATIGE GROOTTE —

deur K. J. KING

1. OMVANG

In die referaat word die op rekenaar gegronde toesigbeheerstelsel wat deur Roodepoort se Elektrisiteitsafdeling geïnstalleer is, beskryf. Die geskiedenis en toekomsplanne word ook bespreek.

2. INLEIDING

Die hoofdoelstelling van enige elektrisiteitsonderneming is om 'n doeltreffende en betroubare voorsiening, soos bronne toelaat, aan te bied. Dié taak word al hoe moeiliker namate die grootte en ingewikkeldheid van die stelsel toeneem.

Die maksimum-lewering by Roodepoort is tans in die omgewing van 100 MW. Weens die groot huishoudelike inhoud van die las is daar sowat 230 verbruikers per MW. Vergelyking met ander Witwatersrandse kragondernemings verskyn in Tabel 1.

SUPERVISORY CONTROL OF A MEDIUM SIZED ELECTRICITY SUPPLY UNDERTAKING —

by K. J. KING

1. SCOPE

The paper describes the computer based supervisory control system installed at the Roodepoort Electricity Department. The history and future plans are also discussed.

2. INTRODUCTION

The prime objective of any Electricity Undertaking is to provide an as efficient and reliable supply as resources permit. This task becomes more difficult with the size and complexity of the system.

The maximum demand at Roodepoort is of the order of 100 MW at present. Because of the large domestic content of the load there are some 230 consumers per MW. Comparison with other Municipal Undertakings on the Witwatersrand appears in Table 1.

MUNISIPALITEIT MUNICIPALITY	GESKATTE AANTAL VERBRUIKERS PER MW APPROXIMATE NUMBER OF CONSUMERS PER MW
Johannesburg	100
Roodepoort	230
Springs	160
Benoni	130
Boksburg	140
Germiston	160

Verder is die lisensiegebied sowat 175 vk. km. Die netwerk is uitgesprei en het 'n lae lasdigtheid — 'n beliggaming van die negatiewe simptome van die "stedelike uitspreiding". Die hoeveelheid kabel wat geïnstalleer word en die inherente kapasitansie daarvan is sodanig dat die arbeidsfaktor by die EVKOM-leweringspunt op pad is na een.

Distribusie vind plaas teen 33kV via met olie gevulde en soliede papiertipe kabels. Daar is 10 distribusiestasies waar die spanning afgebring word na retikulasievlakke van 11 of 6,6 kV.

'n Skets van die lisensiegebied waarop die posisies van die distribusiestasies aangedui word, verskyn in Figuur 1.

In 1972 is die gedagte van 'n toesigstelsel vir die hoofdistribusienetwerk bespreek. Die motivering was onder meer:

(a) Eenvoudige herrangskikking van seksies van die netwerk in grenslastoestande.

(b) Vroegtydige waarskuwing in die geval van defekte apparate.

(c) Makliker foutopsporing deur akkurate identifikasie.

(d) Die afstandbeheer van alle skakelings.

(e) Die aanteken van laste op transformators en vervoerders in tydperke van hoë kragaanvraag.

(f) Die monitor van die druk van die kabelolie en drukalarms.

3. REGVERDIGING

Regverdiging vir 'n toesigstelsel is in die eerste plek diens aan die verbruiker. Dié diens hang van die kragnetwerk af. Daar is geen regstreekse finansiële voordeel nie, buiten moontlik wanneer dit gebruik word vir lasverspreiding met die oog op aanvraagbestuur.

Furthermore the licenced area is some 175 sq. km. The network is spread out with low load densities and embodies some of the negative symptoms of the "urban sprawl". In fact, the quantity of cable installed and its inherent capacitance is such that the power factor at the ESCOM point of supply approaches unity.

Distribution takes place at 33 kV via oil-filled and solid paper type cables. There are 10 distribution stations stepping the voltage down to reticulation levels of 11 or 6,6 kV.

A sketch of the licenced area depicting the positions of the distribution stations appears in figure 1.

In 1972 the idea of a supervisory system for the main distribution network was noted. The motivation included:

(a) Simple re-arrangement of sections of the network under critical load conditions.

(b) Early warning of faulty apparatus.

(c) Easier fault location by accurate identification.

(d) The control of all switching operations remotely.

(e) The recording of loads on transformers and feeders during high demand periods.

(f) The monitoring of cable oil pressures and pressure alarms.

3. JUSTIFICATION

Justification for a supervisory system is primarily an improvement in service to the consumer. This is brought about by the electrical network. There is no direct financial benefit except possibly when used for load shedding for demand management purposes.

Onregstreekse finansiële voordele vir die verbruiker ten opsigte van die besnoeiing van onderbrekingstye kan egter besef word. 'n Voorbeeld hiervan is 'n chemiese aanleg waar, indien daar vir 'n sekere tyd nie krag is nie, staking van installasies en mengers voorkom. Vroegtydige en akkurate verklikking en die gevolglike herstel van lewering het finansiële voordeel vir sowel die verbruiker as sy versekeraar. Dieselfde is van toepassing op kweekhuise waar 30 minute sonder elektrisiteit 'n boer se hele oes kan bederf. In dié geval help die vroegtydige kennis van 'n onderbreking nie die spesifieke verbruikers wat deur 'n onafhanklike toevoer bedien word nie.

4. GESKIEDENIS

'n Toesigstelsel het vóór 1972 reeds bestaan, maar dit het bloot die stroombrekerstatus, transformatoralarms en kabeloliedrukalarms gemonitor.

Alarms is in verskeie posisies op hulprelês geïnstalleer, gewoonlik by die distribusiestasie, en verbind met 'n sentrale punt. Verklikking was natuurlik baie basies en elk van die opstelpunte sou om die beurt besoek moes word vóór die betrokke beskermingstoestel kon word. Nog 'n toesigstelsel wat altyd daar sal wees, is dié van die "ontstoke verbruiker". Dié stelsel het inligting verskaf oor items wat nie spesifiek onder toesig van beheerapparate is nie. 'n Voorbeeld was swak spanningsbeheer wat vir huishoudelike verbruikers nie so kritiek is nie, maar in nywerheidsgebiede baie fyn dopgehou moet word.

5. STELSEL

5.1 ALGEMEEN

Figuur 2 is 'n blokdiagram van die apparatuurkonfigurasie.

Die hart van die stelsel is 'n mini-rekenaar wat ondersteun word deur 'n rekenaar vir programmatuurbeheer en plaaslike sowel as verwyderde teledrukkers. 'n Duplikaat-rekenaarteletipe is gereed vir hulpdoeleindes.

Die koppelvlak met die aanlegapparaat word gehanteer deur die "Highway" — multipleksor en kommunikasie tussen hierdie toestel en die afstandstasies vind plaas deur die "Westronic"-telemeterstelsel. 'n Nabootsdiagram en kontrolebank is vir statusindikasie, alarmverklikking en beheerinisiasie, ens., aan die "Highway" gekoppel.

Uitgebreide gebruik is gemaak van standaardkomponente en, met 'n paar uitsonderings, is min probleme ondervind met vervangingsonderdele.

Desondanks word voorsiening gemaak vir die probleem van onverkrygbaarheid en stappe word gedoen om seksies rondom die nuwe CMOS en mikroverwerktegnologieë te herontwerp. Tot dusver is twee funksies gehanteer deur kringbane wat ontwerp en vervaardig is deur die departement wat die nuwe toestelle gebruik.

5.2 DIE REKENAAR EN SY RANDAPPARATUUR

'n Nova-1220-minirekenaar met 'n 32k-geheue, 'n intydse horlosie en geriewe vir multivlak-apparatuuronderbreking word in die stelselbeheer gebruik. Die rekenaar kan in 'n intydse omgewing werk en vinnig op veranderings van staat reageer.

Verbind aan die rekenaar is 'n rekenaaropnemer vir programmatuurbeheer. Dié eenheid is nou in onbruik en word nie meer deur die plaaslike agente gerugsteun nie. 'n Nuwe slap-skyfie-aandrywing word nou geïnstalleer om hierdie funksie oor te neem.

Die plaaslike tele-eenheid is toegerus met 'n drukker, toetsbord, papierbandleser en papierbandpons. Dié toestel word gebruik vir aantekening en vir klein modifikasies van die programmatuur. Net die drukker van die afstandstele-eenheid word gebruik vir alarmopwekking en verklikking by die afstandsbemande plek.

5.3 DIE "HIGHWAY"-MULTIPLEKSOR

Die koppelvlakfunksie tussen die rekenaar en die apparatuuritems word uitgevoer deur die "Highway"-multipleksor. Die "Highway" kan sowat 320 000 bisse per sekonde tussen die rekenaar en die onderskeie items hanteer. Hoëdrumpellogika is gebruik om 'n mate van geraasimmuniteit te bewerkstellig. Die komponente wat gebruik is, is grootliks standaard en tot op hede is geen ernstige probleme ondervind in die verkryging van onderdele nie. Kaartrandgemonteerde liguitstralende diodes en stapskakelaar is gebruik om eenstapwerking te vergemaklik vir versiening en foutopsporing.

5.4 KOMMUNIKASIE

Kommunikasie met afgeleë buitestasies word bewerkstellig met die goed beproefde "Westronic"-modem. Die frekwensieskuifmetode word

Indirect financial advantage to consumers in the reduction of stoppage time can, however, be realized. An example of this is a chemical works which, when without power for a certain period, experiences plant and mixers seizure. Timeous and accurate alarm annuciation and subsequent restoration of supply is of financial advantage to either the consumer or his insurer. The same applies to cooling of flower farmers' greenhouses, where 30 minutes of power failure could well spoil an entire crop. In this case, however, early knowledge of the stoppage does not help these particular consumers who are on a radial feed.

4. HISTORY

A supervisory system existed prior to 1972, which simply monitored circuit breaker status, transformer alarms and cable oil pressure alarms.

Alarms were installed at various positions on auxilliary relays usually at the distribution station and transmitted to a central point. Annunciation was of course very basic and each of the marshalling points would have to be visited in turn before the protective device in question was identified. Another supervisory system, which was, and will remain, in service is that of the "irate consumer". This system provided information regarding items that were not specifically supervised by control equipment. An example was poor voltage regulation, which may not have been all that critical for domestic consumers but should be carefully watched in industrial areas.

5. THE SYSTEM

5.1 GENERAL

Figure 2 is a block diagram of the hardware configuration.

The heart of the system is a mini computer supported by a computer for software management and local and remote teletype printers. A duplicate computer teletype is on standby for back-up purposes.

The interface with the items of plant is handled by the "Highway Multiplexor" and communication between this device and the remote stations is via the "Westronic" telemetering system. A mimic diagram and control desk are connected to the highway for status indication, alarm annuciation, control initiation, etc.

Extensive use has been made of standard components and, with a few exceptions, little difficulty has been experienced in obtaining replacements.

Despite this, the problem of obsolescence is being anticipated and moves are being made to re-design sections around the new CMOS and micro processor technologies. To date two functions are being handled by circuits designed and manufactured by the Department using the new devices.

5.2 THE COMPUTER AND ITS PERIPHERALS

A Nova 122-mini-computer with a 32K memory, real time clock and multilevel hardware interrupt facility has been used to control the system. The computer is able to perform in a real time environment and to respond quickly to changes of state.

Associated with the computer is a compucorder for software management. This unit is now obsolete, however, and is no longer supported by its local agents. A new "floppy disk drive" is now being installed to take over this function.

The local teletype is fitted with a printer, keyboard, paper tape reader and paper tape punch. This device is used for logging and for minor running software modifications. Only the printer of the remote teletype is used for alarm generation and annunciation at the remote manned site.

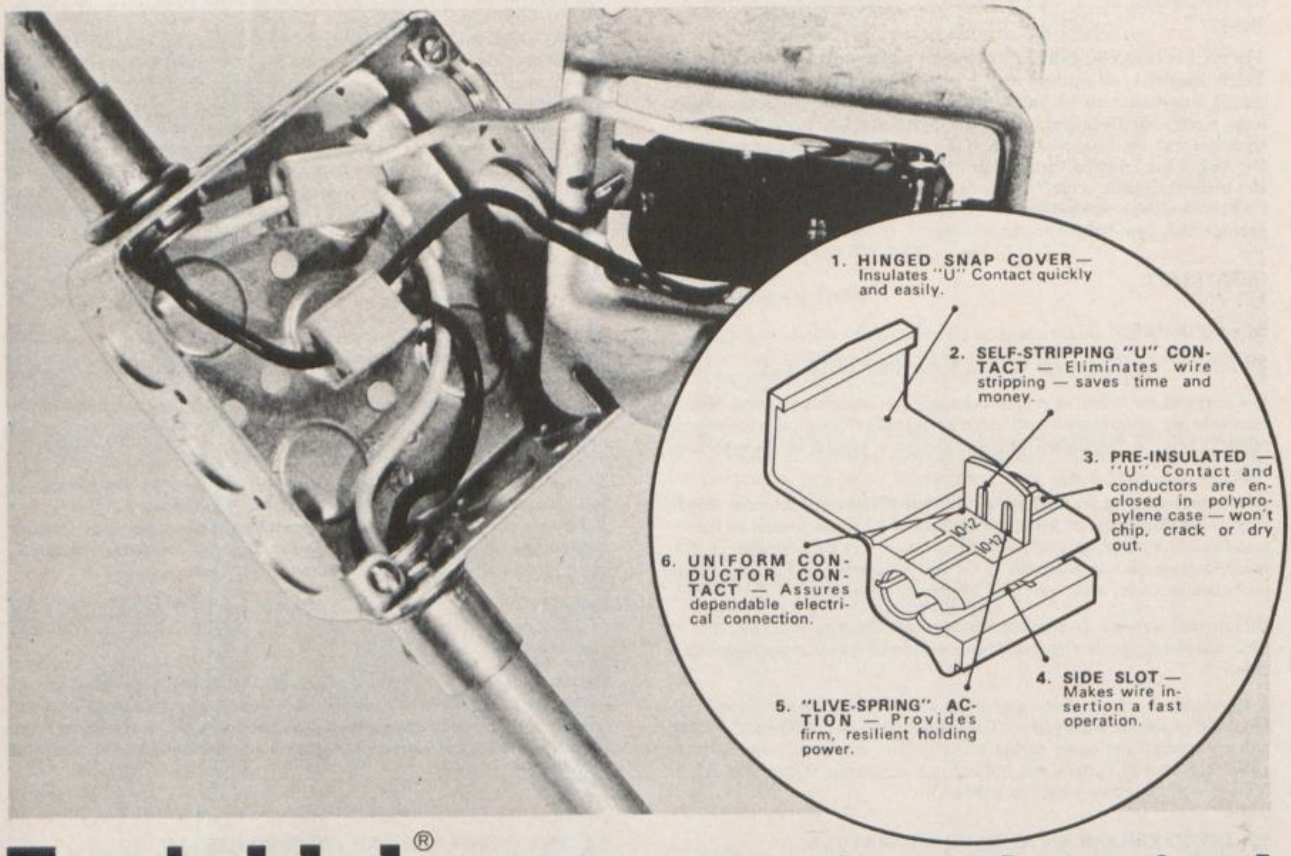
5.3 THE HIGHWAY MULTIPLEXOR

The interface function between the computer and the items of hardware is carried out by the "Highway Multiplexor". The "Highway" is capable of handling some 320 000 bits per second between the computer and the various items. High threshold logic was used to achieve a measure of noise immunity. The components used are by and large standard and to date no serious troubles have been experienced in obtaining spares. Use has been made of card edge mounted light emitting diodes and stepping switch to facilitate single step operation for maintenance and fault location purposes.

5.4 COMMUNICATION

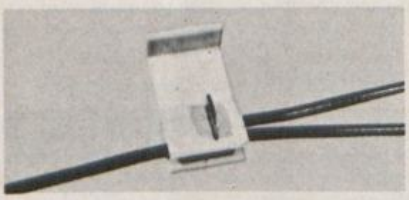
Communication with remote outstations is achieved via the well tried "Westronic" modem. The frequency shift method is employed center-

A new time-saving technique for receptacle wiring



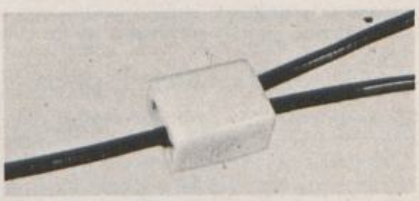
Scotchlok® BRAND Self-Stripping Electrical Tap Connectors

Now approved by the AMEU



1. Insert run and tap wires.

2. Drive "U" Contact down.



3. Snap hinged cover.

Electro-Products Division 3M

P.O BOX 10465. JOHANNESBURG TELEPHONE 36-3211

gebruik met 1,76 kHz as middelpunt. 'n Staptempo van 200 Baud per sekonde is bereik. Gebruik is gemaak van bestaande loodsleidings wat gewoonlik twee 2,5-mm-kerns is van die beskermde loodskabel.

Al probleem wat tot dusver ondervind is, was op die langste kabelloop waar steuring opgemerk is van die Raad se 1 050-Hz-rimpelkontrolefrekwensie. Dit is te bowe gekom deur die lewering van die sender te verhoog en die sensitiwiteit van die ontvanger te verlaag. Stuwingsbeskerming is bereik deur 'n kombinasie van isolasietransformators, stuwingsomleiers en h.ov.-sekerings.

5.5 DIE BUITESTASIE

Die buitestasie het drie hooffunksies om te vervul:

(a) Die monitor van stroombreker- en alarmstatus.

Dit word uitgevoer deur 'n opstelling van 110-V-relês wat verbind is aan hulpkontakte op die stroombrekers, beskermingsrelês en ander toestelle. Vir afwykingsalarms word voorsiening gemaak deur die kragvoorsiening op die betrokke relê paslik te handhaaf. Die status van elke alarm of stroombreker verskyn aan 'n verligte liguitstralende diode aan die rand van die kaartjie. Al hierdie inligting word gedurende elke roetine-aftasting na die rekenaar oorgesein en die besluit oor of 'n verandering in staat voorgekom het of nie en watter stappe gedoen moet word, word deur die rekenaar geneem.

(b) Die monitor van analoë waardes.

Geleistamspannings, voerderstrome en in party gevalle kabeltemperature en oliedrukke word gemonitor deur omsetters. 'n Analoog van 'n digitale omsetter voorsien 'n lewering wat na die rekenaar oorgedra word. Dit gebeur tydens elke roetine-aftasting vir spanningsanaloë en tydens 'n spesiale aftasting vir kabeldata-analoë wanneer stroomanaloë van die rekenaarbeheerbank aangevra word.

(c) Die beheer van stroombrekers.

Dit word uitgevoer deur 'n opstelling van gekodeerde relês en 'n "uitvoer"-relê wat die toemaak van uitklinkspoele op 'n stroombreker in werking stel.

5.6 REKENAARPROGRAMMATUUR

Die beheerstelsel (d.i. die rekenaar, sy programmatuur en sy randapparatuur) het drie hooftake:

(a) Dataversameling in die vorm van syferinligting van buitestasies, nabootsing, bankbeheer, ens.

(b) Werking op hierdie data deur programmatuurmodules.

(c) Data-uitvoer in die vorm van syferinligting wat veranderinge in kontrolebank- en nabootsbeelde, substasiekontroles en dergelike meebring.

Die programmatuurmodules wat in 'n laevlaksamesteller geskryf is, is in vier hoofgroepe verdeel:

(a) Die Werkstelsel

Hierdie programmatuur is 'n produk van die Data General Corporation van Amerika. Dit verskaf die raamwerk vir die werking van die hele stelsel. Dit stel die rekenaar in staat om te werk in 'n intydse omgewing met onderbrekingsgeriewe wat wisselende vlakke van reaksie op eksterne gebeurtenisse lewer.

(b) Die Databasis van die stelsel.

Hierdie model is in die vorm van tabelle wat die uitleg en detail van die aanleg by substasies definieer.

(c) Toestelhanteerders

Dit is die modules wat wisselwerking tussen eksterne apparatuurtoestelle en die werkstelsel bewerkstellig en die invoer- uitvoerbewerkings laat plaasvind. Sommige toestelhanteerders in die stelsel is verskaf as deel van die werkstelsel, bv. die teledrukkeraandrywers. Spesiale hanteerders is egter vervaardig vir die "Westronic"- en die "Highway"-toestelle.

(d) Funksionele modules

Die meeste programmatuur van in hierdie kategorie. Dié modules voer bewerkings uit op die data wat deur die toestelhanteerders versamel is en lewer die uitvoere wat op die nabootser, kontrolebank en die teledrukker aangegee word.

5.7 KRAGBRONNE

Die rekenaar is voorsien van 'n outomatiese herbeginstelsel wat goed gewerk het tydens die kragonderbrekings, maar 'n mate van moeilikheid is ondervind wanneer ernstige dalings in spanning voorgekom het.

ing on 1,54 kHz. A stepping rate of 200 Baud per second is achieved. Use was made of existing pilot wires which are generally two 2,5 mm³ cores of the protection pilot cable.

The only difficulty experienced to date was on the longest cable run where interference was noted from the Council's 1 050 Hz ripple control frequency. This was overcome by increasing the output of the transmitter and decreasing the sensitivity of the receiver. Surge protection is achieved by a combination of isolation transformers, surge diverters and H.R.C. fuses.

5.5 THE OUTSTATION

The outstation has three main functions to perform:

(a) The monitoring of circuit breaker and alarm status.

This is carried out by an array of 110 V relays connected to auxilliary contacts on the breakers, protection relays and other devices. Fleeting alarms are catered for by suitably maintaining supply onto the relay in question. The status of each alarm of circuit breaker appears as an illuminated l.e.d. on the edge of the card. All this information is transmitted to the computer during each routine scan and the decision as to whether or not a change of state has occurred and what action to take is made by the computer.

(b) The monitoring of analogue values.

Busbar voltages, feeder currents and in some cases cable temperatures and oil pressures are monitored by transducers. An analogue to digital converter provides an output which is transmitted to the computer. This occurs during each routine scan for voltage analogues, during a special scan for cable data analogues on demand from the desk for current analogues.

(c) The controlling of circuit breakers.

This is carried out by an array of coded relays and an "execute" relay which operates the close or trip coils on a circuit breaker.

5.6 COMPUTER SOFTWARE

The control system (i.e. the computer, its software and peripherals) has three main tasks:

(a) Data collection in the form of digital information from outstations, mimic, control desk, etc.

(b) Operation on this data by software modules.

(c) Data output in the form of digital information resulting in changes in control desk and mimic desplays, substation controls and the like.

The software modules which are written in low level assembler are divided into four main groups:

(a) The Operating System.

This software is a product of the Data general Corporation of America. It provides the framework for the operation of the entire system. It enables the computer to operate in a real time environment with interrupt facilities allowing differing levels of response to external events.

(b) The Data base of the System.

This module is in the form of tables defining the layout and detail of plant at substations.

(c) Device Handlers.

These are the modules which interact with external hardware devices and the operating system to allow the input output operations to take place. Some device handlers in the system have been provided as part of the operating system e.g. the teleprinter drivers. Special handlers have however been produced for the "Westronic" and "Highway" devices.

(d) Functional modules.

The bulk of the software falls into this category. These modules perform operations on the data collected by the device handlers and produce the outputs which are presented on the mimic, control desk and teleprinter.

5.7 POWER SUPPLIES

The computer is equipped with an auto restart facility which worked well during power failures but some difficulties were experienced when severe voltage dips occured.

Kragvoorsiening aan die beheersentrum is gevolglik verander na 'n battery/laaier/omkeerderkonfigurasie.

Die noodkapasiteit is voldoende vir minstens 12 uur normale werking. Die normale modus van werking is via die battery sodat daar geen onderbreking is tydens 'n onderbreking in die kragtoevoer nie.

Buitestasies word voorsien deur laaiers en batterye met 'n noodkapasiteit van sowat 5 uur. 'n Mens sou kon sê die noodkapasiteite is oorvloedig, maar ondervinding het bewys dat die toesigstelsel besonder nuttig is wanneer die kragtoevoer 'n tyd lank af was en herstel is tot 'n oorlaaide netwerk.

5.8 SEKURITEITSKONTROLE

Sekuriteit word verkry deur die nou verouderde pariteitstelsel saam met die onmiddellike herinterrogering van die stasie wat reageer met 'n staatverandering. Twee aftastings moet dus die staatverandering en die pariteit bevestig voor die inligting as geldig beskou kan word.

Dit is interessant om daarop te let dat tot datum nog geen verkeerde inligting van hierdie bron opgemerk is nie en verandering na polinominale kontrole is blykbaar nie geregverdig nie.

6. WERKING

6.1 Aftasting

Elke stasie word om die beurt geïnterrogeer en sein sy status en analoë stamspanningwaarde oor na die rekenaar. So 'n interrogasie kan meer as een aftasting benodig, afhangende van die grootte van die bepaalde stasie. Die rekenaar vergelyk die nuwe inligting met dié wat alreeds in die geheue is en voer die voorgeskrewe funksies uit. Dit kan verskil tussen eenvoudige bywerking (bv. stamvolts) of opwekking van 'n alarm- of logprosedure. Hierdie roetine-aftasproses neem tans ongeveer 30 sekondes om te voltooi. Dit is relatief lank en daarom moet sorg gedra word, byvoorbeeld, wanneer die moontlikheid van sluiting van 'n stroombreker in 'n fout bestaan, aangesien die stelsel die sluiting en klinksekwensie dalk nie registreer nie. Dit kan ook moontlik wees om 'n outo-hersluitwerking mis te loop.

Spesiale aftastings word deur die kontrolebank geloods wanneer 'n operateur 'n stroomanaloogwaarde benodig of wanneer stasiemeterlesings benodig word. Kabel temperatuur en oliedrukanaloë word ook via die roetine-aftasting versamel, maar dit word elke 15 minute deur die programmatuur geloods.

Gedurende stroombreekwerking het die aftasproses 'n verminderde voorrang en die kommunikasie met die stasie en gekose breker word oorheersend.

6.2 Roetinewerking

Op ontvangs van inligting wat 'n staatverandering by 'n buitestasie bevat, veroorsaak die rekenaar 'n nabootsdiagram wat bygewerk moet word, die insident wat op die teledrukker opgeneem moet word, die alarmliggies op die kontrolebank en die nabootsing wat verlig moet word en 'n hoorbare alarm wat opgewek moet word wat die operateur moet waarsku. Die alarm kan dan deur die operateur ontvang word en die staatverandering aangeteken word.

Hierdie werking is analoog met die ou hulprelêstelsel wat op hardedraad gebaseer is behalwe dat 'n nabootsing beskikbaar is, die alarm word duidelik onderskei wat betref soort en ligging en 'n aantekening van die alarm word gemaak.

Die presiese stamspanning by 'n spesifieke perseel is op versoek beskikbaar van die rekenaar. Indien die stamspanning buite die vooropgestelde perk is, word 'n alarm opgewek.

'n Lys van alarms en moontlike staatveranderings verskyn in Tabel 2.

6.3 Kontrolewerking

Om 'n stroombreker te beheer, kies die kontrolebeampte die betrokke stasie en breker deur middel van die tuimelwiele op die bank en stel die werkingknop (klink of sluit) vooraf. Die rekenaar stel die adres van die betrokke stasie en breker op, sein dit oor na die Highway en dan na die buitestasie wat ooreenstem met die terugkontrole. Op ontvangs van 'n geldige terugkontrole druk die beampte die uitvoerknop wat dan die betrokke OCB beheer. Omdat gebruik gemaak word van nie-roetine-aftastings is die analoogwaarde van die stroom onmiddellik beskikbaar en bygewerk op die bank.

Die beampte teken dan aan of die analoogwaarde na zero val en of dit nie-zero word byvoorbeeld wanneer die stroombreker geopen of gesluit word.

Power supply to the control centre was consequently changed to a battery, charger, inverter configuration. Sufficient standby capacity exists for at least 12 hours of normal operation. The normal mode of operation is via the battery so that there is no interruption during power failures.

Outstations are supplied by chargers and batteries with some 5 hours standby capacity. It may be argued that the standby capacities installed are luxurious but experience has proved that the supervisory system is most useful when the supply has been off for some time and is restored to an overloaded network.

5.8 SECURITY CHECKS

Security is achieved by the now obsolete parity system together with immediate re-interrogation of the station responding with a change of state. Two scans must therefore confirm the change of state and the parity before the information is considered valid.

It is interesting to note that to date no incorrect information from this source has been detected and change over to polynomial checking is propably not warranted.

6. OPERATION

6.1 Scanning

Each station is interrogated in turn and transmits its status and busbar voltage analogue value to the computer. Such an interrogation may require more than one scan, depending upon the size of the particular station. The com-utor compares the new information with that already in memory and carries out the prescribed functions. These may vary from simply updating (e.g. busvolts) to generating an alarm or logging procedure. This routine scanning process takes about 30 seconds to complete at present. The time period is relatively long so that care must be taken, for example, when the possibility exists of closing a circuit breaker onto a fault, as the system may not register the close and trip sequence. It may also be possible to miss an auto reclose operation.

Special scans are initiated by the control desk when an operator requires a current analogue value or when station meter readings are required. Cable temperature and oil pressure analogues are also collected via a routine scan but this is initiated by the software every 15 minutes.

During circuit breaker operation the scanning process gas a reduced priority and communication with the station and breaker selected becomes paramount.

6.2 Routine Operation

On receipt of information embodying a change of state at an outstation the computer causes the mimic diagram to be updated, the incident to be recorded on the teleprinter, the alarm lamps on the control desk and the mimic to be illuminated and an audible alarm to be generated to alert the operator. The alarm can then be accepted by the operator and the change of state noted.

This operation is analogous to the old hardwired auxilliary relay based system except that a mimic is available, the alarm is clearly annunciated as to type and location and a record of the alarm is made.

The exact busbar voltage at a particular site is available on request from the computer. Should the busbar voltage be outside preset limits, an alarm is generated.

A list of alarms and possible status changes appears in Table 2.

6.3 Control Operations

To operate a circuit breaker the control officer selects the station and breaker in question by means of the thumblewheels on the desk and then presets the operation (either trip or close) button. The computer sets up the address of the station and breaker in question, transmits it to the Highway and then to the outstation which responds with a revertive check. On receipt of a valid revertive check the officer depresses the execute button which then operates the OCB in question. Because use is being made of non-routine scans the analogue value of the current is updated on the desk.

The officer then notes whether the analogue value falls to zero or becomes non-zero when the circuit breaker is opened or closed on load for example.

6.4 Aantekening

Elke staatverandering word op die teledrukker aangeteken. Inligting wat betref die datum en tyd sowel as die detail van die gebeurtenis word aangebied. Die afstand-teledrukker word gebruik vir alarmopwekking by 'n bemande buitestasie na ure. Die gedrukte inligting is so dat personeel direk na die betrokke stasie gestuur kan word eerder as om eers na die beheersentrum te gaan. Ander logfunksies wat slegs aan die plaaslike teletipe vertoon word sluit in die daaglikse verbruik en maksimum aanvraag by elke stasie sowel as drukstukke van kabeltemperature en oliedruk. 'n Voorbeeld van 'n tipiese daaglikse opgawe van die teledrukker verskyn in Tabel 3.

6.5 Instandhouding

Die beheer en instandhouding van 'n stelsel soos die een wat beskryf is, is nie so eenvoudig soos 'n mens graag sou wou hê nie. Die kundigheid wat hierby betrokke is, is nie dié wat gewoonlik beskikbaar is by 'n tradisionele elektrisiteitsvoorsieningsonderneming nie. Hierdie kundigheid moet dan verkry word deur of geskoolde personeel in diens te neem of 'n mens se eie op te lei, wat dalk die onderneming later kan verlaat.

Werkwinkelgeriewe en -toerusting is nodig, asook kundigheid van programmatuuronderhoud en bywerkgeriewe.

7. TOEKOMSPLANNE

Die toekomsplanne vir die stelsel is grootliks gebaseer op moeilikhede wat ontstaan het en wat oorkom moet word.

7.1 Programmatuur

Die hoofprobleem met die programmatuur, en terloops die stelsel wat dit aandryf, is dat elke stasie as 'n unieke eenheid hanteer word en dus 'n klein veranderinkie benodig by 'n spesifieke perseel, 'n programmatuurverandering. Op hierdie stadium kan 'n verandering nie aangebring word sonder om 'n gespesialiseerde programmeerder se hulp in te roep nie.

Een van die grootste oorwegings waarom rekenaargebaseerde toerusting gebruik word, is om sulke veranderings te vergemaklik en die voorneme is om 'n gestandardiseerde modulêre program in waarskynlik 'n hoëvlaktaal te ontwikkel om te verseker dat veranderings op 'n vryer manier gemaak kan word. Dit is natuurlik ten koste van doeltreffende geheuegebruik en aftastyd. Die huidige 30 sekondes is al reeds te lank vir outohersluiting en veelvuldige uitklinking.

Die berekening en inisiëring van lasverspreidingaktiwiteite kan dalk ook die moeite werd wees. Dit blyk dat lasverlies deur spanningvermindering, relatief maklik tot berekening herlei word en geredelik op rekenaargebaseerde tegnologie toegepas kan word. Akkumulasieverwarmers, ens. werk egter nie heeltemal so voorspelbaar nie, veral in huishoudelike installasies. As die rekenaarprogramme egter ontwikkel word op so 'n wyse dat die masjiene kennis neem van 'n groot verskeidenheid faktore, insluitend die gewildheid van televisieprogramme, dan kan dit prakties blyk te wees.

7.2 Apparatuur

Die benadering tot apparatuurveranderings moet in die toekoms na intelligente buitestasies oorhel. Die koms van die mikroverwerker sal dit waarskynlik vergemaklik. Dit is heel moontlik dat beskermrelês 'n volledige verandering sal ondergaan, en die opsientoerusting verbind sal wees aan die instrumenttransformators, deur gepaste transduktors, en die mikroverwerker die plek van die tradisionele elektromeganiese relês inneem. In die afsienbare toekoms sal die bestaande posisie van die skeidingsvlakstelsel, d.i. agter die beskermrelê, egter gehandhaaf word.

Daar is begin met suksesvolle vervanging van sommige van die ouer toerusting met CMOS-gebaseerde komponente met die gebruik van optiese isolasie tegnieke.

Hoe meer aktief die buitestasie gemaak word, hoe kleiner word die vereiste van die kommunikasiestelsel. Dit is sekerlik 'n bietjie aanmoediging om die buitestasiebesluite en werkings te desentraliseer.

8. SLOT

Die toesigstelsel is amptelik in Julie 1975 in gebruik geneem en is sederdien gebruik om die doeltreffendheid en betroubaarheid van die elektrisiteitsvoorsiening te verbeter. Dit, net soos die netwerk wat dit bedien, is 'n groeiende en veranderende toestel wat die sukses van die doelwitte van die elektrisiteitsvoorsieningsonderneming te Roodepoort bevorder.

6.4 Logging

Each change of state is recorded on the teleprinter. Information as to the date and time as well as the detail of the occurence is presented. The remote teleprinter is used for alarm generation at a manned outstation after hours. The information printed is such that personnel can be despatched directly to the station in question rather than first having to visit the control centre. Other logging functions which are only presented to the local teletype include the daily consumption and maximum demand at each of the stations as well as print-outs of cable temperatures and oil pressures. An example of a typical daily record from the teleprinter appears in Table 3.

6.5 Maintenance

The operation and maintenance of a system such as the one described is not as straightforward as one would like. The skills involved are not those normally available on a traditional electricity distribution undertaking. These skills have then to be obtained at the cost of either employing skilled personnel or training one's own, who may well be lost to the undertaking afterwards.

Workshop facilities and equipment are necessary as well as software maintenance skills and updating facilities.

7. FUTURE PLANS

The future plans for the system are based largely on difficulties which have arisen and which must be overcome.

7.1 Software

The main problem with the software, and incidently the system which it drives, is that each station is handled as a unique unit and so a minor change at a particular site requires a software change. At present a change cannot be carried out without calling in a specialized programmer.

One of the major motivations for employing computer based equipment is to facilitate such changes and the intention is to develop a standardized modular programme in probably a high level language to ensure that changes can be made in a more liberal fashion. This must of course be at the expense of efficient memory utilization and scan time. The present 30 seconda is already to long for auto reclosing and multiple tripping. The calculation and initiation of load shedding activities may also prove worthwhile. It would appear that load shedding by voltage reduction is relatively easily reduced to calculation and may be readily applied to computer based technology. Storage heaters and the like, however, do not perform quite as predictably as might be expected particularly in domestic installations. However, if computer programmes are developed whereby the machines can take cognizance of a multitude of factors, including the popularity of television programmes, then this may prove feasible.

7.2 Hardware

The approach to hardware changes must in the future lean towards an intelligent outstation. The advent of the microprocessor will probably facilitate this. It is quite possible that protection relaying will suffer a complete change and the supervisory equipment will be connected to the instrument transformers via suitable transducers and the microprocessor take the place of the traditional electromechanical relays. In the foreseeable future, however, the existing position of the system interface i.e. behind the protection relay, will be maintained.

A start has been made in successfully replacing some of the older equipment with CMOS based components using optical isolation techniques.

The more active one makes the outstation, the smaller the requirement on the communication system becomes. This is certainly some incentive to decentralize outstation decisions and operations.

8. CONCLUSION

The Supervisory System was commissioned officially in July 1975 and has since then been used to improve the efficiency and reliability of the electricity supply. It, like the network it serves, is a growing and changing device which promotes the achievement of the aims of the Electricity Supply Undertaking at Roodepoort.

TABLE 2

INFORMATION PROCESSED BY THE SYSTEM

Routine Scans

Scan	Word 1	Word 2	Word 3	Word 4
First	Address	OCB 1—8 Indications	OCB 9—16 Indications	Busvolts No. 1
Second	Address	OCB 17—24 Indications	OCB 25—32 Indications	Busvolts No. 2
Third	Address	OCB 33—40 Indications	Isolators 1—16 Indications	Busvolts No. 3
Fourth	Address	Isolators 17—32 Indications	Isolators 33—48 Indications	Busvolts No. 4
Fifth	Address	Isolators 49—64 Indications	Special Alarms Overload Earth fault Translay Spare R.E.F. Diff. Bucholtz Winding Temp. Oil Temp. Low oil Out of step Qualitrol 4 Spares	Special Analogue
Sixth	Address	General Alarms Remote switching Stations 1—9 Security Fire Aux. supply Station Battery Superv. Battery Spares 1—2	Cable Oil Pressure 1—10 Transformer Alarms 1—6	Special Analogue
			Special Scans	
Seventh	Address	kWh 1	kWh 2	Spare
Eighth	Address	kWh 3	kWh 4	Spare
Nineth	Address	Nothing	Nothing	Cable pressure Analogue No. 1
Tenth	Address	Nothing	Nothing	Cable Pressure Analogue No. 2
Eleventh	Address	Nothing	Nothing	Cable Temp. Analogue No. 1
Twelfth	Address	Nothing	Nothing	Cable Temp. Analogue No. 2

TABLE 1
TYPICAL RECORD FROM THE TELEPRINTER

Routine Scans

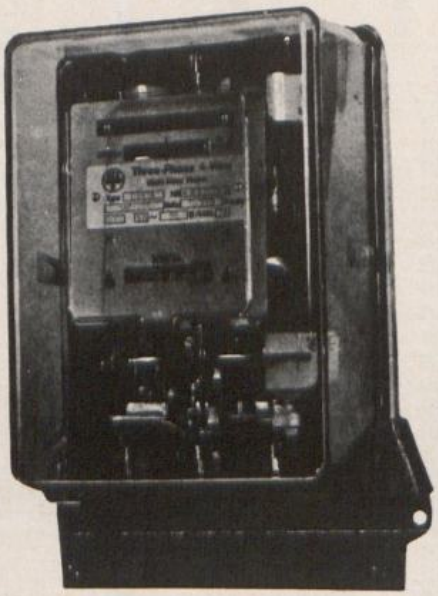
30/03/78		07:03:43	SENTRAAL	AMP 13	392
30/03/78		07:03:54	SENTRAAL	AMP 14	394
30/03/78		07:04:03	SENTRAAL	AMP 15	68
30/03/78		07:04:16	SENTRAAL	AMP 16	65
DRUK	1A	81	PSI		
DRUK	2A	80	PSI		
DRUK	1D	81	PSI		
DRUK	2D	75	PSI		
DRUK	1E	128	PSI		
DRUK	2E	150	PSI		
TEMP.	1A	31	C		
TEMP.	2A	31	C		
TEMP.	1B	30	C		
TEMP.	2B	30	C		
TEMP.	1D	31	C		
TEMP.	2D	29	C		
TEMP.	1E	29	C		
TEMP.	2E	32	C		
30/03/78		08:13:51	WILRO PARK	DEUR	OOP
30/03/78		08:15:11	WILRO PARK	DEUR	TOEGEMAAK
30/03/78		12:00:22			

PENNYSTRAAT	KWU1	84810	MAX	6150	BY	2100	UUR
MANUFACTA	KWU1	0	MAX	0	BY	1200	UUR
KLOOFENDAL	KWU1		MAX	0	BY	1200	UUR
KLOOFENDAL	KWU2	197056	MAX	7000	BY	2100	UUR
ROODEPOORT	KWU1	34960	MAX	2292	BY	800	UUR
ROODEPOORT	KWU2	80148	MAX	4833	BY	1000	UUR
ROODEPOORT	KWU3	0	MAX	0	BY	1200	UUR
ONTDEKKERS	KWU1	100508	MAX	9576	BY	100	UUR
ONTDEKKERS	KWU2	0	MAX	0	BY	1200	UUR
SENTRAAL	KWU1	376300	MAX	22000	BY	1900	UUR
SENTRAAL	KWU2	380300	MAX	22000	BY	1900	UUR
SENTRAAL	KWU3	130000	MAX	9000	BY	1200	UUR
SENTRAAL	KWU4	140000	MAX	9000	BY	1200	UUR
FLORIDA	KWU1	40425	MAX	2646	BY	1900	UUR
FLORIDA	KWU2	0	MAX	0	BY	1200	UUR
FLORIDA	KWU3	0	MAX	0	BY	1200	UUR
FLORIDA GLEN	KWU1	0	MAX	0	BY	1200	UUR
FLORIDA GLEN	KWU2	91614	MAX	5490	BY	800	UUR
FLORIDA NORTH	KWU1	66852	MAX	4212	BY	1900	UUR
GLEN LEA	KWU1	40969	MAX	2544	BY	100	UUR
GLEN LEA	KWU2	0	MAX	0	BY	1200	UUR
30/03/78	12:02:11						
PENNYSTRAAT	TWT1	0					
PENNYSTRAAT	TWT2	7					
PENNYSTRAAT	TWT3	10					
MANUFACTA	TWT1	0					
MANUFACTA	TWT2	0					
MANUFACTA	TWT3	0					
KLOOFENDAL	TWT1	0					
KLOOFENDAL	TWT2	11					
KLOOFENDAL	TWT3	0					
KLOOFENDAL	TWT4						
ROODEPOORT	TWT1	0					
ROODEPOORT	TWT2	0					
ROODEPOORT	TWT3	0					
ONTDEKKERS	TWT1	0					
ONTDEKKERS	TWT2	0					
FLORIDA	TWT1	16					
FLORIDA	TWT2	0					
FLORIDA	TWT3	0					
FLORIDA GLEN	TWT1	0					
FLORIDA GLEN	TWT2	35					
31/03/78	05:49:06		FLORIDA	BKR 9	GEKLINK	OORVRAG	
31/03/78	05:49:19		FLORIDA	BKR 10	GEKLINK	OORVRAG	

POLYPHASE WATT-HOUR METERS

Made in Western Germany by:

Deutsche Zähler-Gesellschaft



* Accuracy ratings to BSS, VDE and IEC specs
* Case dimensions to DIN specifications
* Magnetic bearings
* Transparent or standard black covers
* Transformer or direct connection

Ex-stock availability of the following:

–/5 A	380 V	3-wire
–/5 A	220/380 V	4-wire
25 A	220/380 V	4-wire
50 A	220/380 V	4-wire
100 A	220/380 V	4-wire

Distributed in South Africa by:

PAN AFRICAN ELECTRIC (PTY) LTD.
18-20 WINDER STREET DURBAN 4001
PHONES:– 321627 324952
TELEX:– 6-2793

MR. P. WRIGLEY, Salisbury:

First of all I would like to congratulate Mr. King on a most interesting, informative, and thought provoking paper. It was of particular interest to myself to read of the history of telecontrol in Roodepoort as its computer based system came from the same stable as the Salisbury second stage supervisory control development and is very similar.

Salisbury's first experience with supervisory control dates back to 1956 when two independent electro-mechanical systems were installed for the 33 kV and 11 kV networks respectively. All functions on this system are carried out with a coded signalling system in which a train of pulses operating through the Department's pilot and telephone cable network performs the selection and operation of all devices. At this time the system M.D. was about 75 MW with an area of supply of approximately 1 550 sq. km and these 20 channel systems provided switchgear indication and operation, telemetering and alarm facilities from each major control substation. The cost and installation charges for the central control room common equipment was R11 000, whilst each outstation cost R 900. Today some twenty-two years later with a system M.D. of 230 MW and more than 60 000 consumers, these two systems are still in operation after having been extended to provide additional functions, relocated into a larger control room and re-arranged so that the circuit breaker portion of the display is shown directly on the system diagram. Notwithstanding these changes the systems still operate very efficiently and without trouble on exactly the same principle as when first installed.

As Mr. King comments, rightly so in my opinion, any requirement for supervisory control stems from inadequacies in system operation normally drawn to the notice of the undertaking in the first place by the irate consumer. Many of these shortcomings are tolerated where undertakings and the number of consumers served by them are comparatively small, but as the growth problem escalates something better is required particularly where the consumer warning system becomes inoperative due to the use of closed ring systems. The question then arises of at what stage in the development of an undertaking can the installation of a telecontrol system be justified.

Very convincing arguments can be advanced that system operation can be improved and interruption times reduced if more system data is made available to the system controller. What one has to guard against, however, is the collection of reams of data which may be statistically very nice yet utterly bewildering to a practical operator who could well do without the over-supply of what is to him useless information.

Information whether valuable or not can only be obtained at a price and this does not just mean the initial cost of the equipment. Software management in a hardware environment is not easy and can be expensive. Software training of personnel if adequate facilities are not available is difficult. The ability to change software is not a simple task and there certainly is not enough work on a small system for a full time programmer to be employed, consequently the work falls to an electrotechnician or engineer. Perhaps the future with its hobby computers and complicated programmable calculators will reveal some of the mysteries of programming to a less select band of the population and then, possibly, the required software expertise will be more readily available.

A lot of small undertakings, and I still regard Salisbury as a small undertaking, could and do get along quite nicely with an electro-mechanical system. It is comparatively cheap to install and maintain and today, when one has to temper ones ideas and ideals on telecontrol with a realistic consideration of the overall impact on an undertaking's finances, it could be a favourable proposition for many years.

I find it very difficult to go along with Mr. King's statement that there is no direct financial income attributable to telecontrol. If this is so, such a system should not be installed as its effect can only be inflationary on the tariff structure.

I believe that in an area where full telecontrol is justified one could expect benefits including:

(a) comprehensive remote control emergency load shedding for either tariff or fault purposes;
(b) a reduction in consumer hours lost during faults;
(c) facilities for load transfer on the 33 kV and 11 kV systems;
(d) maximum benefits from cyclic loading of plant;
(e) secure and flexible operational communications;
(f) reduction in manpower required for system operation with consequent reduction in salaries payable.

As an illustration of the benefits that can be achieved from a full micro processor based telecontrol system in a large undertaking, I would briefly draw your attention to the claims made for such a system recently installed overseas by the parent company of the one who installed both the Roodepoort and Salisbury systems. There were three units installed in a 7 680 km² area catering for 1,6 million consumers with an M.D. in excess of 3 000 MW . Apparently the installed system will give complete telecontrol of 83% of the area's primary substations which contain 88% of its 11 kV switchgear. Cash benefits are expected to amount to 30 000 pounds per year initially rising to 700 000 pounds per year at 1975 prices. It is also significant that with a 45% disconnect situation it is claimed the manpower required under the new system will be five times less than with the limited control system that has existed for many years.

Now to the system technicalities. I find it very disconcerting that only six years after the Roodepoort system has been installed, Mr. King is talking of obsolescence. Admittedly the rate of development in this field is rapid and one can expect improvements in various aspects of telecontrol from year to year. But once a well engineered system is installed it should be capable of meeting all the demands made on it without further refinement for a period well in excess of six years. Regrettably, however, the age of the take-over bids is with us and inevitably when such events take place the customer is often left high and dry to fend for himself while the new masters look for other more lucrative horizons, notwithstanding the fact that all the expanding expertise and back-up is still available, should they require it, from overseas principals. I would therefore hasten to warn undertakings venturing into this field to do their homework thoroughly and be particularly careful in evaluating the attractive looking offers. Some of these may be well worth while but there are those that can bring disenchantment when the after sales service falls into oblivion and obsolescence quickly becomes a reality.

The computer based system in Salisbury with its greater sophistication was introduced with the development of its 132 kV system and caters for a central control with five outstations initially. An hourly log of all important analogues is typed out on the teleprinter, this being the only record kept. However, it would seem to be quite adequate while the system is small. All alarms are also logged on the same teleprinter.

Difficulties have been found using the teleprinter and computer on the same inverter supply. The dips in power supply caused by the teleprinter starting current causes the programme to be corrupted in seven to ten days. Normally the programme will remain running for, on average, up to ten weeks and only then needs to be reloaded.

Initially the programme was loaded through the teleprinter but this 70 minute task was liable to corruption and the 12 K programme is now loaded in 40 seconds with a fast paper tape reader. This has proved to be most efficient and satisfactory and I would not be looking to anything quite as sophisticated as a floppy disc drive for the foreseeable future.

The Salisbury system has only one computer. Software management on such a system is not feasible and has only consisted of debugging existing programmes and writing very small patches using debug. These have been assembled and documented by a back-up service from the suppliers. The need for a second computer as a back-up has not manifasted itself in real terms as to date the computer has failed only once in four years. The delay in getting the system running again was entirely due to customs problems when the computer was returned to the agents for repair.

Outages of the system caused by lightning damage at the outstations have been more frequent and in terms of damage, more severe. This coupled with the fact that the scanners were initially fitted with inferior integrated circuits caused extremely erratic behaviour of this telecontrol system and made the operators very wary of it. Unfortunately they are still inclined to keep only to clearly defined limits and do not explore the operations and the strength of the system.

Despite the modern technology the old electro-mechanical system which is still very much in use on the 33 kV and 11 kV distribution systems appears to operate and detect changes of state faster. This is basically because it detects changes at the outstation and responds with an immediate alarm and a consequent scan to find the item changed. The continuous scanning procedure of the computer based 132 kV system puts any change of state into a time pattern although the speed of the system could be significantly enhanced if a hardware or microprocessor change of state detection could be implemented at the outstation. This of course could only be done at a price.

It is relatively easy to be convinced of the need for a second computer to provoke back-up, a very fast means of loading programmes whenever the need arises and the many other refinements that can go with such a system. However, the cost of telecontrol then escalates out of all proportion and the original concepts that justified the need for a system in the first place are completely overlooked.

In view of the absolute necessity to keep tariffs to reasonable levels in these inflationary days I would advise anyone contemplating a modern telecontrol system to first evaluate very carefully the effect that such a system will have on tariffs before embarking on the exercise. Used carefully, telecontrol can be a very useful operational tool, used in any other way it can become a highly expensive luxury.

I hope my remarks will have been of some help to those who are involved in or are about to enter this supervisory control field.

My thanks again to Mr. King for so ably introducing the subject and giving this Convention the benefits of his wide experience in it.

I am quite sure that supervisory control, whether in its simple or more sophisticated form, will continue to assume a very important role wherever there is development of distribution or transmission systems taking place.

MISS M. T. POTGIETER, ESCOM

I would like to thank Mr King for his paper which clearly presents the functions performed by the Roodepoort telecontrol system in relation to the goals which were established for the system. Of particular note is the way in which the equipment has served its purpose in a cost-effective manner without using over elaborate man-machine interfaces or software aids.

As is inevitable, the experience gained in using and running the system has led to a need to improve the software capabilities of this telecontrol scheme. This is probably the correct way to go about implementing this type of telecontrol facility. It is often the uninitiated user who is tempted to plunge into the deep end with an elaborate system which is not necessarily the right or financially justifiable solution. Regrettably, sometimes such a solution is sought where there is not even a problem.

A particularly commendable aspect of the paper presented to us, is that it reports an actual, working, computer-based telecontrol scheme. Mr King is almost unique in doing this. In most symposia, seminars and such 'shop windows' in the Telecontrol industry, papers are presented about systems which exist in concept, or are partially designed, still at the manufacturing stage, are about to be delivered, and so on. Very rarely does anyone speak in public about the results of these preliminary boasts. I have been guilty of this myself recently; and found this same situation at an international conference on centralised control held in London in March 1978.
The author has therefore presented to us a very valuable summary of achievements. It would be of use to all of us if more information could be given on the performance of this system. Here I have in mind the hardware availability and realiability achieved with the configuration used, with special reference to the cold standby arrangement; the types of faults experienced with hardware and software; the problems found in training and keeping skilled staff; the effectiveness of local support by manufacturers vs selfsufficiency in maintenance. I believe we can have a very useful discussion on the experience gained on existing telecontrol schemes in RSA since almost all municipal users of computerised telecontrol systems are here today.

Several comments have been made about actual obsolescence and anticipated obsolescence. There are two aspects here which are cause for concern. The first is obsolescence typified by the case of the 'compucorder' which is no longer supported in this country. It is worrying that we are often faced with this problem. Perhaps we should be more independent as equipment users and be capable of carrying our own spares and doing the maintenance.

Although this can be expensive in the short term, it does have long term advantages. Equipment bought from reputible suppliers usually has a spares availability guaranteed for at least ten years, even if the composite unit is no longer being made.

The second aspect is obsolescence of certain electronic components leading to the redesign of sections of equipment using up-to-date technology such as CMOS and microprocessors. This does seem worrying in view of the fact that the system was installed as recently as 1975. But there is a discernable trend in the field of electronic systems that 'If it works, it is obsolete'. This is the attitude presented by many salespeople when they are seeking a customer for yet another new, hot-off-the-presses, unproven piece of equipment or system. We have to accept that all equipment has a definite economic working life, and that we must get the most out of that investment, no matter how apparently out of date it is. This is an offensive thought for anyone with an interest in electronics, micro-processors and state of the art devices. It is difficult to suppress that driving urge to fiddle with circuitry to bring about so-called 'improvements' in circuits which are already working satisfactorily.

Where I do agree with modification is in the example given of circuit breaker status reporting in which the states of 'tripped on closing' and 'auto reclosure' can not be transmitted to the control centre. It is a known problem with older generations of telecontrol systems. The danger exists of causing damage to a circuit breaker by closing it repeatedly on to a fault because the operator is not aware of the fault.

This leads me into the topic of security in data transmission. I cannot agree that single bit parity is obsolete. Consider the extensively used ASCII code which depends on one parity bit per character transmitted.

With a relatively well behaved communications medium it has the advantage of high message efficiency since only one bit of the standard word is used for error checking. It appears that the Roodepoort system requires two scans to confirm that a change of state report is correct. This means that the system uses a method of checking generally called double transmission. This has good security in which the probability of finding an error is 1—2—n where the message is n bits long. The disadvantage is that the message efficiency is only 50%. Compared with the effectiveness of double transmission use of a cyclic polynomial code check is not warranted, especially if it involves hardware and software changes. It could, however, improve message efficiency.

As has been indicated in the paper the communication structure and response times have become a problem.

A means of improving the network would be to operate in a radial fashion rather than on a party-line as is done at present. Then each outstation could communicate with the control centre independently of other outstations. This would remove the time wasting serial polling of one outstation after the other by the control centre and allow each outstation to communicate effectively in parallel. This would require additional buffering hardware and some software changes at the control centre.

Alternatively, it seems a waste not to use the unloaded cable circuits more effectively at signalling rates of 600 or even 1200 bits per second.

This would depend on the control centre and the outstation ability to operate at these speeds. The transmitter/receiver system used may be capable of successful operation at the higher speeds. The danger exists that the ripple control signalling could again interfere with the telecontrol signalling unless due care was taken of filtering, signal strengths and sensitivities. The original problem experienced with the ripple control signals interfering with the telecontrol system appears to indicate a filtering deficiency in the existing signalling units which are clearly not built to CCITT specifications.

A last comment on the actual system in use refers to the control centre power supply. The decision to run the control centre on the mains supply is startling, not only in its simplicity, but in its boldness. Valuable experience was obviously gained in this venture. It would be of interest to know what configuration of power supply is now used and what availability is achieved.

I would like to comment briefly on the future plans proposed for this system. As far as software is concerned, the problem leading to the desired change in system programming language and facilities can be readily appreciated. The requirements do seem to be a bit beyond the capability of the present processor. Some details of the proposed implementation would be interesting. For instance is it intended to include an interactive system which will ease definition of new stations and functions?

We can all take note that Parkinson's laws are applicable to computer systems. The work expands to fill the facilities available. And there is a corollary that states that it also overflows all estimated storage and processor utilisation!

We have been eagerly watching the emergence of the 'intelligent' outstation using microprocessors. It is an inevitable development, but should be kept in perspective. It is all very well to think of an outstation scanning a substation and only sending data when a change occurs in alarms or circuit breaker status, or an analogue value change exceeds a preset threshold. But the emphasis shifts to the reliability of the outstation and its test facilities. It must be extensively self checking, and be able to advise the control centre that it is working properly. This means that the scanning software in the control centre has new duties to perform in conversing with the outstations. It must interpret diagnostic messages and cope with a new structure of data reporting. The microprocessor based outstation could be programmed from a central computer. This can be quite a simple change such as adjusting the threshold at which an analogue variation is reported, or extensive like reprogramming the entire outstation operation.

Another school of thought exists in which the price advantage of a simple microprocessor is used for a cheaper construction of the common control logic in the outstation without exploiting its full capabilities. This is valid design goal, but does not yield the data reduction or decentralised control of the fully used microprocessor outstation.

Telecontrol is a fascinating subject and there are as many arguments for as against various philosophies of operation and implementation. It has been a pleasure to participate in this introduction to the discussion forward to a lively debate in the open discussion period.

MNR. P. J. BOTES, President:

Dame en here, dit is die eerste keer sover my kennis strek dat 'n dame die VMEO — van die VMEO-verhoog af die VMEO-lede toegespreek het oor so 'n uit en uit tegniese aspek. Ons dank aan u en hoop dat dit die begin is van 'n nuwe era, dat ons veel meer dames in ons gehoor sal sien. Baie dankie.

MNR. M. W. ODENDAAL, Alberton:

Mnr. die President die besluit om 'n gesofistikeerde toesigbeheerstelsel vandag aan te koop en in bedryf te stel teen 'n uitgawe wat wissel tussen 'n kwart-miljoen en 'n half-miljoen Rand is nie 'n besluit wat ligtelik geneem kan word nie. Bo en behalwe die kapitaalbesteding kan die bedryfskoste om die toerusting in stand te hou en die beheerbank te beman 'n taamlike hap neem uit die jaarlikse begroting. Soos die skrywer tereg sê is daar geen regstreekse finansiële voordeel nie en moet regverdiging hoofsaaklik gesoek word in die verbeterde diens aan die verbruiker.

Alberton met 'n lewering van 85MW en met 'n geskatte 130 verbruikers per MW het 'n eenvoudige goedkoopstelsel wat redelik doeltreffend werk.

Die sewe substasies wat tans die maksimum lewering van 85MW voorsien, is elk met sy eie loodskabel verbind met die administratiewe kantoor. 'n Poskantoor huurlyn verbind die administratiewe kantoor met die beheersentrum van die brandweerstasie, wat natuurlik gedurig beman word. Enige verandering van status by 'n 33kV substasie word by die kantoor sowel as die Brandweerstasie aangekondig deur 'n klokkie sowel as 'n liggie wat die betrokke substasie aandui.

Die apparaat om die sewe inkomende seine op 'n enkele kabel na die brandweer oor te dra is departementeel ontwerp en gebou teen 'n koste van ongeveer R300 en werk uitstekend, weerlig ten spyt.

Die belangrikste funksies van die hele stelsel word dus 24 uur per dag vir 7 dae 'n week gemonitor en 'n elektrisiën op gereedheidsdiens word binne minute na enige foutiewe substasie gestuur.

Ondervinding het geleer dat as die proteksie-relês se tydstelling korrek ingestel word om genoegsame diskriminasie te hê, word enige fout onmiddellik gelokaliseer.

Interessantheidshalwe kan net gemeld word dat 'n nuwe invoerpunt ten suide van Alberton gemonitor word deur middel van 'n Radio-uitsending op 'n kanaal wat normaalweg deur die Brandweerstasie gebruik word vir twee-rigting kommunikasie.

Enige alarm het ten gevolg dat 'n audio sein aanvanklik vir 10 sekondes en daarna vir 'n gedeelte van 'n sekond elke 15 sekonde uitgesaai word. Die kanaal kan dus nog gebruik word vir gewone kommunikasie terwyl iemand op pad is om die alarm te herstel. Dankie.

MR. D. C. PALSER, Cape Town:

Mr President there is little doubt that the rapid advances that have been made in electronic and computer technology in rcent years, coupled with an attendant steady drop in prices, have today brought sophisticated and flexible computer based supervisory control systems within relatively easy financial reach of most electricity undertakings of reasonable size.

A few years ago, though, the position was quite different. For instance, when Cape Town commissioned its first comprehensive supervisory control system some 13 years ago, electronic and computer techniques had not yet reached the high level of sophistication that they have today. Consequently, this early system which, incidentally, is of the common-diagram type, was wholly electro-mechanical. Despite the fact that this system catered for all four basic facilities, namely circuit breaker status, circuit breaker control, telemetry and alarm annunciation, its limitations soon became apparent in the light of the rapid advances then being made in the electronic and computer fields. The limitations of this early system were particularly evident in the telemetry mode and some seven years ago the system was supplemented by a more sophisticated computer based telemetry system of greater accuracy, reliability and flexibility.

This new telemetry system now permits circuit loadings to be printed out as a percentage of the rated capacity of the relevant circuit, either on an individual one-shot basis or repetitively at selectable time intervals. In addition, it gives instantaneous and automatic print-outs of overloaded circuits and, once a day, at midnight, prints out for statistical and design purposes, the maximum loading of all circuits over the past 24 hours.

About five years ago it was decided not to extend the electro-mechanical section of the combined electro-mechanical/computer system but rather to adopt a new fully electronic computer based system for all future extensions, including provision for under-frequency load shedding. This under-frequency load shedding facility is integrated into the supervisory control system, with the under-frequency relays in the outstations being arranged to shed pre-programmed blocks of load, taking into account both the Escom input at the time and the rate of frequency decline. The pre-programmed load to be shed is updated at 5 minute intervals.

No problems were experienced in interfacing the new system with the old hybrid system and the combined systems have operated perfectly satisfactorily over the past five years, the failure rates having been extremely low. Maintenance has accordingly been no problem: nor has obsolescence. The only problem we are faced with, if it can be called a problem, is that the system is fast reaching the limit of its present capacity!

Regarding maintenance, it may be of interest to note that we have found it useful in diagnosing faults to audibly monitor data transmissions. A trained operator can readily distinguish a normal transmission from a faulty one by the characteristic tone of the transmission.

Concerning the scanning speeds of our systems, I would mention that the original electro-mechanical system operates in the serial polling mode with a relatively slow scan rate of 2 minutes for 21 outstations. The computer based systems, however, employing two inter-linked computers, operate in the parallel or synchronous polling mode at a far faster scanning rate, namely a mere 200 ms for all outstations.

The software of the Cape Town system is modular and standard for all outstations thereby enabling system changes to be carried out readily and quickly without having to resort to time consuming hardware changes, as appears to be the case with the Roodepoort system.

We also employ our supervisory system for a number of sundry control and supervisory functions, for example to change transformer taps, to disable outstations while carrying out routine trip testing and for monitoring the intruder alarm systems in outstations. Perhaps Mr King would comment on whether he uses his system for similar or other miscellaneous functions.

While on the subject of alarms, I might add that we initially arranged for all fleeting alarms from outstations to self-reset automatically on clearance. This feature, however, was found to be a decided disadvantage and we have now arranged for all fleeting alarms to latch-in at outstations against subsequent manual clearance.

I note that Roodepoort is updating certain of its older equipment and employing opto-isolators. It might be worth mentioning that we employ opto-isolators in our alarm circuits and that trouble was experienced initially because of over-sensitivity, resulting in spurious alarms triggered by surges on the system. The problem was overcome, without any adverse effects, by desensitising the circuits.

One final point of interest concerns Mr King's reference to the care that must be exercised to ensure that the registration of an immediate trip of a circuit breaker after a close command is not lost. To obviate this difficulty we have arranged for our system to automatically check the breaker status after a close command to ensure that the breaker has in fact closed.

Thank you Mr. President.

MR. E. P. TRAUTMANN, Ladysmith:

Mr. President, Ladies and Gentlemen — I would like to thank Mr. King for giving us an insight into the method and operation of Roodepoort's supervisory system.

Most of the smaller towns rely on the good old supervisory system Mr. King calls "irate consumer".

The next step forward I found in Ladysmith, when I took over from mr. Frank Stevens, was a milli-ampere meter connected in series with resistances at the main substations and a primary battery. Depending on which resistance was shorted by a tripping circuit breaker via pilot cables, the resulting reading of the instrument indicated which substation had tripped.

Presently we have invested in an electronic scanning system to receive some 40 circuit breaker indications within 60 seconds, which i find to be sufficient for out undertaking for many years to come.

At this stage, Mr. President, I would like to raise one point which is close to my heart, and which I would like to bring to the attention of our Executive Council.

Most of our contributions here are of real importance to perhaps 20% of our Member Undertakings, in the larger towns and cities. Although they are very important to all of us — and necessary — the problem of the remaining 80% of Member Undertakings are too seldom considered. Load control computerised systems, supervisory controllers, etc., are too big a mouthful for small undertakings, who have not the load — nor the financial and personel resources — to justify their introduction.

This 80% of our Member Undertakings is not being considered by our leaders, who naturally are the cream of our Association, but have domestic affairs and problems very different from ours.

I suggest, and I do so as a retiring member, that the Executive Council consider more working sessions, which would serve the needs and meet the problems of the average sized undertakings as well, e.g. alternatives for the control of smaller systems, tariff guides, etc.

But coming back to that very interesting paper, I imagine that Roodepoort's supervisory system will be of great value to such a large Undertaking. May I ask what the total costs are to date?

A further question, a technical one — Does Mr. King use unscreened cores parallel to his Solkor pilot cores and are induced surges not causing interfering? Finally, what size of battery do you use in outstations?

Thank you.

MR. F. M. HESSE, Affiliate:

Mr. President, Lady and Gentlemen — Mr. King's paper has indicated the successful use of Mimic Displays with a computer base system and, in this connection, I would like to mention that there are three basic methods of displaying a network to the supervisor. The first, of course, is the mimic display, the second is the utilization of a conventional mimic with a graphic V.D.U., and the third method is graphic V.D.U. only.

Now the choice will obviously depend on the layout and the size of the system and the operator's skills.

I think one of the more important functions in a small supervisory and tele-control system is the automatic logging of all important events as they occur and here your printer — logging printer — becomes, I think, a vital part of the system, not under normal running situations, but where you have a false situation occurring in the network and the supervisor cannot possibly remember exactly what has happened as things go wrong in a rapid sequence of events. Therefore, I think, automatic logging is one of the very important features.

Regarding micro-processor outstations, there is one very difinite advantage or use for a micro-processor outstation in this connection, and that is for fault sequence logging where the supervisors at a later stage can look back at the situation and establish exactly in what sequence certain events occurred.

Regarding Mr. Wrigley's contribution, I must say my heart rather filled with joy, when i heard him say something about the electro-mechanical system and that it has been going for something like 22 years. I was involved at the time with the design of this equipment and as I say, it is rather gratifying to know that these old electro-mechanical systems are still operating satisfactorily.

Regarding the fault uptake time on Mr. Wrigley's new system, I'm surprised that this is slow, slower than his old electro-mechanical system, because one of the important facilities that should be built into any control system is that you have a fast response where you need it, and you need a fast response on any faulty condition that occurs on your network so that, as Mr. Wrigley said, you do not reclose circuit breakers when they should not be reclosed purely because you have not got updated information.

Regarding Marie Potgieter's contribution, I noted that quite a lot was said about message structure and security, and I was partiocularly interested in the comments regarding radial and part-line communications.

Our philosophy in this connection is to go radial wherever possible, and rather use slow, secure connunications links with our outstation, but all in parallel, so you are addressing all your oustations at the same time. I think even on small systems this can prove advantageous; it does mean a little extra hardware, but that little extra hardware will certainly save you those vital minutes at a time when they are required.

The multi-turn transmission referred to by Mr. Odendaal is certainly a very sound method of transmitting a small amount of information, but I think he may have already come to the conclusion that the number of signals that he can communicate over a single pair of wires is very limited.

Coming back to micro-processors, with the advent of their use in tele-control it is possible now to look at small modular systems where you have a micro-processor master station, with say 4 or 8 outstations which will readily cater for the requirements of the small municipalities. I'd like to mention that particularly to Mr. Trautmann if I may.

Thank you Mr. President.

MR. G. R. MARLOTH, Johannesburg:

Mr. President, Lady and Gentlemen — As you've heard, Johannesburg has also embarked on this thorny path of commissioning a computer based tele-control system. It is not in operation yet, so I'll resist the temptation to tell you about it, but I do hope that there will be an opportunity in the future when we can invite you to come along and demonstrate it to you.

One of the things we've recognised in this whole process of trying to buy such a system, is this problem of obsolescence. In fact, if we wrote the specification today we would probably write things into it that we did not consider a year or so ago. So I think one comes across terms like micro-processor based outstations, graphic displays with colour control of the foreground and control of the background, video-trend capability, data based management systems and all manner of buzz words which mean — MONEY!

What I would like to tell you about is the preparation that we have embarked upon, I think any municipality runs into the problem that the amount of staff available for interfacing to existing plant is limited. The nature of this plant is such that one does not readily allow the contractor into protection relay and indication circuits and, therefore, one is generally dependant on one's own staff for doing this.

The problem when installing a large system is to get the connection to the plant completed in a suitable time to be able to enjoy the benefit of the system.

The approach that we followed in Johannesburg was to try and do this in advance as far as possible, and we have done this by purchasing junction cubicles in a small outstation. I think that it could be done with a marshalling kiosk of some sort, where all the plant cabling is completed beforehand, and then a standard interface to the tele-control outstation remains. This can be done by means of suitable plug connections, but even a standard terminal strip would be quite adequate for getting a rapid connection of the outstation to the main plant in the substation. We've made very good progress along this route already and we do foresee that as the apparatus cubicles from the tele-control system arrive, we will be able to connect them up within a day or two and get on with the job of commissioning these stations immediately. There won't be any problem with delays of months, possibly even more, while we wait for our staff to make the interconnection.

The other area that has been brought out here today is the question of training staff. Large municipalities are certainly in a very much stronger position than a small one, but we decided to try and get in at an early stage and, to do this, we purchased a micro-processor training system. This whole area of training systems and evaluation kits and development systems is again a very wide field, but there are a number oif these training systems on the market now at a very modest price, and if one takes the trouble to make sure that the training materials and the handbook are of a suitable type, then these can be extremely useful.

The one system that we bought is certainly orientated to a specific family of micro-processor devices, but the training material went under the glorious title of a "bug-book". This name came from the appearance of these integrated circuits, so like bugs when they die and land on their backs with their feet in the air.

This particular system proved to be very useful because we were able to give this to staff who had a very limited background in electronic circuits. It starts off from basic principles, it takes trainees through the basics of electronic circuits and certainly gives them a very good introduction into the whole question of micro-processor operation and micro-processor software. We were able to use this without any form of training scheme.

We have had trainee technicians fighting to get their hands on the equipment and had an electrician who, without any prompting, got to the stage where he could write very adequate programmes. One programme that he wrote was to generate morsecode; he could then feed his message into the micro-processor through a typewriter and this produced suitable morsecode at a desired speed.

Now, the point about this is that it is possible to train staff provided that one can get one's hands on the right training equipment. But I would also sound a word of caution here. The micro-processor suppliers will tell you all about their latest development system which start off at R20 000, and that's quite a considerable outlay.

What one really gets for this sum of money is a baby mini-computer system and the data sheets and handbooks on this assume a considerable level of expertise on this whole question of micro-processors. The person who is new to the game finds that it is very difficult indeed to make a start with this type of system.

Certainly when one gets the proper training system it does make it possible to train people and get a start on the whole problem of how does one take an electrician and get him to maintain a mini-computer system.

The question has also been raised — "aren't these systems too expen-

sive for the majority of municipalities represented here?" I do believe that the micro-processor has caused a revolution in this area. We at present have a micro-processor operating in our control centre which is interfaced to electro-mechanical equipment and to a telemetering system. This electro-mechanical equipment dates back to 1963, so it is of some considerable vintage.

Our micro-processor is used for two tasks: the one is to monitor the telemetering system and, at selected intervals, produce a punch-paper tape, which we then take across to the general business computer and use for analysis. Its other task is to control a printer and, by monitoring the status indication lights on our existing system, the micro-processor then produces a printed record of all changes of state.

I believe that the cost of the system, if it were to be purchased as a whole, would still not exceed R10 000, so certainly these developments can be made applicable to the smaller systems.

We also have something else which we have found very interesting. This is a radio system which monitors a remote substation. It is used at this stage to bring back eight alarms, but the capacity of this system, which uses digital transmission on a normal two-way channel, is something like 16 indications from a station, and we have the ability to address up to 2 048 different stations. So capacity is not a limitation. It uses the two-way radio system that we use for dispatching our vehicles and we found it extremely reliable. The transmission lasts for two seconds, so there is no interference with a normal operation.
We were quite interested to observe the reactions of the people using this system when it was first commissioned. What we found was that the outstation would wait until there was a break, it would jump in, get a two-second transmission off its chest, and the person at the other end would'nt even have realised that he had been interrupted by the supervisory system. This went in at a very low price, so I would say — yes, there is plenty of equipment which meets the needs of the small municipality, and can give the same benefits as these very expensive systems which are being installed in the larger municipalities.

Now, when I say that, I don't mean that the large municipalities are spending money unnecessarily, but I think the difference here really is the large quantity of information that is brought back on a large electrical system, and also the implications of delay in getting this information back. For instance, in the event of a power failure in the central business district of Johannesburg, it would take an electrician an excessively long time to reach the affected substation using a motor vehicle because of the chaotic traffic jams caused by the loss of traffic lights. It would be quicker for the electrician to walk!

So, I think, each of these technologies has its place, but certainly there is no need to say that there is a lack of appropriate technology for the small distribution systems.

Thank you.

MR. MAX CLARKE, Randburg:

Thank you Mr. President — Simple question to bring us back to a certain amount of reality. These systems, being highly sophisticated, tend to glamourise the aspect of electronics, and technicians have to work them. Would Mr. King please tell us about the pilot cables involved, the quality of jointing techniques — something generally about these aspects.

Thank you.

MR. K. J. KING, Roodepoort:

Mr. President, I would like to thank all the contributors to the Paper. I am pleased that it has generated some interest.

As regards the size of the undertaking, in response to Mr. Wrigley's contribution, I think it is fair comment to say that the Roodepoort system is about in the middle as far as the AMEU is concerned. We are about one-tenth of the size the largest, and we're possibly about ten times larger than the smallest, so I think we are about in the middle.

The point I made regarding "no direct income", I still maintain is valid in the context of the system described. But it is not unlike synchronising traffic lights — there are large amounts of money that can be saved by having a good robot system. There are large amounts of money that can be saved by having a good electricity supply, and I think to have a good electricity supply, you must know the state of your network, and I think, in this context, there comes a stage when some sort of monitoring supervisory system becomes essential.

This matter of obsolescence has cropped up frequently, and I think I would like to join some of the other speakers by saying it is something we must watch. There are many pitfalls in this area, for example, I was reading the covering letter accompanying the successful tenderer's offer on the Roodepoort system and it was stated categorically that a tiled mimic was worth its weight in gold. Now, they didn't, and neither did we, specify the tile size, but a one-inch or 25,4 mm tile was used instead of a 25,0 mm tile and, if the accuracy of my wife's kitchen scale is anything to go by, we're getting very close to the cost of its weight in gold!

The point raised by Miss Potgieter regarding the change to cMos and micro-processor technology is taken. In the cases referred to in the paper, there have been other motivations for redesigning the equipment and, in a case in point, we acquired a sort of random data acquisition of an intermittent nature, that we simply could not clear so we re-designed the totaliser cards around the cMos technology and we have now cleared this problem.

Some thought has been given to the problem of a long scan time and, in the new programmes, it has been decided to maintain the serial poling method of interrogation and not to convert to the more efficient radial system with the attendant buffering hardware requirement.

There are also insufficient pilot cable cores to permit exclusive communication between the control centre and each outstation. A middle route is being sought in this scan-time problem by only monitoring the automatic plant, i.e. circuit breakers, alarms etc., on a high priority scan. We then monitor the fixed equipment, i.e. isolators and the like on a low priority scan. In this fashion we expect to reduce the scan-time to some 12 seconds for the former priority and to increase the latter scan time to some 7 minutes. Obviously, if an operator happens to be operating at a station at the time, the control officer can improve the priority rating of the isolator, so that he knows exactly what is happening at the site in question.

I feel that this should be the first step, and then use can be made of an improvement in the band rate to the level suggested as a next step.

We do not think the point made regarding message efficiency is all that onerous, since the double transmission only occurs when a change of state has in fact occurred. This means that it does not interfere significantly with our message efficiency.

It is interesting to note that the problems we have experienced are not dissimilar to those experienced on the Salisbury system, particularly as far as software is concerned. We have similar systems although the software has been prepared by completely different people or under different arrangements, and exactly the same difficulty has occurred.

Failures directly attributable to the computer hardware are very infrequent, we estimate that a mean time between failures is in the region of about six months. Only a single fault has been experienced with the Control Centre Computer interface, which includes the scanner. To date, as in the case with the Salisbury system, lightning has been by far the greatest cause of trouble.

The pilot cables have been extensively protected by 25kV isolation transformers, by gas discharge lightning arrestors, sener diodes, etc., and we have had quite good success with this.

The vast majority of problems are now confined to a single outstation, which is situated on the top of a ridge in a particularly severe lightning area. Analysis of the faults reveals that the 110V supply which runs throughout the yard and is used for O.C.B. closing, indications, etc., was a path by which these surges entered the system.

All interfacing to the O.C.B.'s is now via isolation relays mounted on P.C. boards and rated at 2kV insulation. We previously had trouble where the lightning jumped this barrier and blew the tracks off the P.C. boards. 220-Volt varistors have now been fitted at strategic points and we have had no subsequent damage.

Initially problems were experienced with the scanners which, as in the case of Salisbury, were caused by a faulty batch of integrated circuits. Once these and the batch of faulty regulator chips had been replaced, the outstation equipment proved to be highly reliable. No accurate fault records have been kept but, apart from the lightning problems on the station mentioned, the fault rate is estimated to be of the order of 3 faults per outstation per annum.

The question of cold standby has been considered. The standby machine takes roughly 20 minutes to connect and load, which is not considered to be an excessively long downtime, particularly in view of the fact that we only experience a computer problem once every six months. After considering the cost of electronic switching to couple this machine, the frequency with which a reload is necessary, and the use to which we put our cold standby machine when it is off-line in a fault level analysis calculation, we feel that adhering to the cold standby is a valid thing to do.

Staff and training has been mentioned quite a lot and I was interested in what Mr. Marloth said, but on our setup we have a very small requirement for staff. We have to have good staff, we have to have trained staff, but we only need one or two. We have not got a system large enough to warrant the sort of training scheme that has been suggested, although we are very interested to see what they propose doing in Johannesburg.

'At Roodepoort we have employed an Engineer and a technician with extensive experience on the system, and they are aided by two assistants. In order to justify this, we have included other electronicaly related departments in this area, and this section is also responsible for robot installations, two-way radio installations and, to some extent, load control.

With the rapid replacement of electro-mechanical devices by these electronic devices, we feel that this department is well justified and will become quite an interesting department in the future.

We have stated that the software has become inadequate, and we have a few plans as to what to do about it. It is also encouraging to note that, in accordance with some of the other speakers, we seem to be well on the right way, unless all of us together are on the wrong way, but we are all going in the same direction.

Future plans for the software included a single standard outstation, which will greatly reduce the core requirements. Each word and bit will be dedicated to a specific function and will be the same for all outstations. This has the advantage of placing no constraints on expansion in either the hardware or the software. The data transfer efficiency will be reduced by something like 30%.

At this stage there are many ideas to be considered as to what the precise future requirements for the system will be and what we should in fact undertake.

The cost of investigations and the load on our staff is a problem. It is difficult to decide exactly what is a going concern and what we should just leave alone as a still-born idea.

As I have said, we have decided to rewrite the software in a high level language, making it as modular and consequently as open-ended as possible. Although the high-level language has a higher core overhead than the assembler, this will be partially offset by the increased programming efficiency, for example when calculations are required, the availability of programmers in high-level language is also far greater.

Miss Potgieter has also made the point that she felt our present hardware availability is not likely to be able to achieve what we hope. Our rough estimate has indicated that we need some 26K., to do what we want to do, and we have 32 available. I hope that we are right and she is wrong, time again will tell.

Another advantage in writing these programmes in a high-level language is that should the Nova computer itself become unavailable or obsolete, we are not completely limited to a single machine.

Mnr. Odendaal ek wil met u saamstem, die koste-aspek van 'n sisteem soos hierdie is 'n baie belangrike storie. Ek wil graag sê dat mnr. Wrigley 'n heel goeie elektro-meganiese installasie het wat baie goed werk, maar ek wonder as hy dieselfde besluit nou moes neem, of hy nog steeds by elektro-meganiese toerusting sou bly?, of sou hy ook miskien, in hierdie dae, miskien belangstel in 'n rekenaar-gebaseerde sisteem.

The justification for a system such as this is always a very difficult problem and I maintain that it is a matter of service. These things are going to cost money, there is no doubt about it. As far as Mr. Palser is concerned, again I agree with him and also with his comments on justification.

I think he asked whether we use our system for other functions as well. We certainly monitor things like door alarms and other odds and ends, and we are now considering having a look at alarms from water-pump stations, sewerage pump stations and the like, but this is something in the future. We certainly make as much use as possible of the system.

His comments regarding the tripped-on closing of breakers are also noted, and in our new programme, when we make provision for the new software, we will certainly bear these things in mind.

As far as Mr. Trautmann is concerned, I think his estimate of the costs is of the right order. We don't know precisely what our cost is, but I think if we are talking between R4 and R500 000 for the final thing, we are in that ball park area.

He was worried about the fact that we might have surges on the pilots that interfere with the information. If this occurs, and it does, the information is completely garbled and the computer takes no notice of it whatsoever, and continues quite happily along.

He also asks about the size of the battery on the outstation. Now, I'm afraid he's got me here, I think it is of the order or 40 ampere/hours, but I certainly will let him know precisely what it is.

We started out with a smaller unit with some 10 ampere/hours but found that this was inadequate for the supply we were looking for. Regarding Mr. Hesse's contribution, in our particular case, I think we are going to stick to our present communication system. If we go into what he suggests, we will be involved in considerably more buffering hardware, and we are limited in the number of pilot cores we have available, as I said previously.

I would like to underline Mr. Marloth's view that this whole business comprises a thorny problem. Any people who are thinking of taking the step of introducing such a system should obtain as much information as they possibly can. The question of obsolescence in this sphere is a difficult one. It is also encouraging to note that if Mr. Marloth had to specify Johannesburg's equipment again tomorrow he would also do so differently. We certainly would!

Mr. Marloth's comment regarding connection to plant via a junction box is a very sound one I think. This was one of the problems we experienced, although we followed much the same principle that he did. We had a junction box placed in the substation and all the wiring from the circuit breakers and relays etc., was carried out prior to, or should have been carried out prior to the delivery of equipment, but as he also says there is the difficulty of limited staff and, on an undertaking such as ours, if the power is off then everyone runs, so this took longer than we would have liked.

I was also interested to note the radio devices they used in Johannesburg, as we have a similar requirement for our Civil Defence setup.

Mr. Clarke queried the quality of pilot cables and the standard of jointing required. This is precisely the same cable, precisely the same joint and so on that is required for the standard protection system.

MR. P. J. BOTES, President:

Supervisory control in an Electricity Undertaking as described in the paper and discussions, has become available to even smaller municipalities and, therefore, a paper on this subject is timeous.

What I do not appreciate, however, is that Mr. King, who so ably presented this paper, is leaving the service of Roodepoort Municipality shortly.

Ken, thank you for delaying your resignation in order to see me through this Convention. This is appreciated, and I wish you everything of the best in your new job. I am sorry that you have to leave us.

On behalf of Members of the Association it gives me great pleasure to hand you a tie as a token of our appreciation.

Our friends from Rhodesia tell me that they have to issue tools as well as shotguns to their workmen, which we do not have to do here in the Republic, at least not yet. We appreciate the difficulties they experience in Rhodesia and we are pleased to have them with us at this Convention.

As a token of our appreciation, Mr. Wrigley, will you kindly accept an Association tie.

Dames en here, dit is nie aldag dat ons Ingenieurs op ons eie platform van Elektrotegniese-gebied deur 'n dame toegespreek word nie. Dit is ook vir my 'n voorreg dat mej. Potgieter ingewillig het om as een van die bespreking-inleiers waar te neem. Ongelukkig kan ek nou nie aan haar 'n das gee nie, maar ek het besluit om haar 'n klein geskenkie aan te bied as teken van ons dankbaarheid. Sal sy asseblief na vore kom?

VERSLAG VAN DIE SEKRETARIS VIR DIE JARE 1977 EN 1978

Namens die Uitvoerende Raad van die Vereniging van Elektrisiteitsondernemings van Suid-Afrika lê ek met genoeë die volgende beknopte oorsig van die aktiwiteite van die VMEO vir die finansiële jare 1977 en 1978 aan u voor.

UITVOERENDE RAAD

Tesame met hul Raadslede wat deur die betrokke elektrisiteitsondernemings genomineer word, is die volgende tien Ingenieurslede tydens die 45ste Konvensie gehou te Oos-Londen in 1977 gekies tot die Uitvoerende Raad:

K. G. Robson	—	Oos/East London	— President
P. J. Botes	—	Roodepoort	— Aangewese President President Elect
E. de C. Pretorius	—	Potchefstroom	— Dagbestuurslid Standing Committee
J. K. von Ahlften	—	Springs	— Dagbestuurslid Standing Committee
W. Barnard	—	Johannesburg	
J. D. Dawson	—	Uitenhage	
D. H. Fraser	—	Durban	
J. A. Loubser	—	Benoni	
K. J. Murphy		Somerset West/Wes	
A. J. van den Berg	—	Krugersdorp	

Die Uitvoerende Raad het 4 keer vergader, terwyl die Dagbestuur ook 4 keer byeengekom het

TAKKE

Die ondergemelde lede het as ampsdraers van die Takke gedien:

2.1

Hoëveldtak/Highveld Branch 1976/77

Voorsitter/Chairman	—	J. A. Loubser	Benoni
Ondervoorsitter/Vice-Chairman	—	H. J. de Bruin	Randfontein
Sekretaris/Secretary	—	J. van S. Lochner	Brits

1977/78

Voorsitter/Chairman	—	J. J. de Bruin	Randfontein
Ondervoorsitter/Vice-Chairman	—	J. van S. Lochner	Brits
Sekretaris/Secretary	—	J. P. J. Greyling	Pietersburg

Die Tak hou gereeld twee-maandelikse vergaderings wat goed bygewoon word deur die lede.

2.2

Goeie Hoop-tak/Good Hope Branch 1977

Voorsitter/Chairman	—	D. C. Palser	Kaapstad/Cape Town
Ondervoorsitter/Vice-Chairman	—	T. Pollock	Gordonsbaai/Bay
Sekretaris/Secretary	—	A. C. T. Frantz	Kaapstad/Cape Town (Ere-lid/Hon. Member)

1978

Voorsitter/Chairman	—	T. Pollock	Gordonsbaai/Bay
Ondervoorsitter/Vice-Chairman	—	H. A. L. Louw	Paarl
Sekretarus/Secretary	—	A. C. T. Frantz	Kaapstad/Cape Town (Ere-lid/Hon. Member)

Die Tak vergader gereeld kwartaalliks.

2.3

Natal-tak/Branch 1977

Voorsitter/Chairman	—	K. H. Bobeck	Eshowe
Ondervoorsitter/Vice-Chairman	—	T. L. Swart	Glencoe

REPORT OF THE SECRETARY FOR THE YEARS 1977 AND 1978

On behalf of the Executive Council of the Association of Municipal Electricity Undertakings of South Africa I take pleasure in submitting the following condensed review of the activities of the AMEU for the financial years of 1977 and 1978.

1 EXECUTIVE COUNCIL

Together with their Councillor Members, who are nominated by the electricity undertakings, the following ten Engineer Members were elected to the Executive Council during the 45th Convention held in East London in 1977:

K. G. Robson	—	Oos/East London	— President
P. J. Botes	—	Roodepoort	— Aangewese President President Elect
E. de C. Pretorius	—	Potchefstroom	— Dagbestuurslid Standing Committee
J. K. von Ahlften	—	Springs	— Dagbestuurslid Standing Committee
W. Barnard	—	Johannesburg	
J. D. Dawson	—	Uitenhage	
D. H. Fraser	—	Durban	
J. A. Loubser	—	Benoni	
K. J. Murphy		Somerset West/Wes	
A. J. van den Berg	—	Krugersdorp	

The Executive Council met 4 times, whilst the Standing Committee also held 4 meetings.

2 BRANCHES

The following members held office in the Branches:

2.1

Hoëveldtak/Highveld Branch 1976/77

Voorsitter/Chairman	—	J. A. Loubser	Benoni
Ondervoorsitter/Vice-Chairman	—	H. J. de Bruin	Randfontein
Sekretaris/Secretary	—	J. van S. Lochner	Brits

1977/78

Voorsitter/Chairman	—	J. J. de Bruin	Randfontein
Ondervoorsitter/Vice-Chairman	—	J. van S. Lochner	Brits
Sekretaris/Secretary	—	J. P. J. Greyling	Pietersburg

This Branch holds well attended meetings every second month.

2.2

Goeie Hoop-tak/Good Hope Branch 1977

Voorsitter/Chairman	—	D. C. Palser	Kaapstad/Cape Town
Ondervoorsitter/Vice-Chairman	—	T. Pollock	Gordonsbaai/Bay
Sekretaris/Secretary	—	A. C. T. Frantz	Kaapstad/Cape Town (Ere-lid/Hon. Member)

1978

Voorsitter/Chairman	—	T. Pollock	Gordonsbaai/Bay
Ondervoorsitter/Vice-Chairman	—	H. A. L. Louw	Paarl
Sekretarus/Secretary	—	A. C. T. Frantz	Kaapstad/Cape Town (Ere-lid/Hon. Member)

This Branch meets every quarter.

2.3

Natal-tak/Branch 1977

Voorsitter/Chairman	—	K. H. Bobeck	Eshowe
Ondervoorsitter/Vice-Chairman	—	T. L. Swart	Glencoe

1978

Voorsitter/Chairman	—	T. L. Swart	Glencoe
Ondervoorsitter/Vice-Chairman	—	J. S. Gamble	Greytown

2.4

Oos-Kaaplandse Tak/Eastern Cape Branch 1977

Voorsitter/Chairman	—	K. H. D. MacMillan	Umtata
Ondervoorsitter/Vice-Chairman	—	C. E. Adams	Port Elizabeth

1978

Voorsitter/Chairman	—	C. E. Adams	Port Elizabeth
Ondervoorsitter/Vice-Chairman	—	J. D. Dawson	Uitenhage

Algemeen 2.5 **General**

Al die takke funksioneer goed en sake word voortdurend van die takke na die Uitvoerende Raad van die VMEO verwys.
Die vergaderings van die takke is hoofsaaklik toegespits op studiewerk, vermeerdering van praktiese kennis, die uitruil van gedagtes en die verhoging van standaarde binne die werkskedules van die elektrisiteitsondernemings.

All the branches are functioning well, referring matters of interest continually to the Executive Council of the AMEU.
The meetings of the branches are mainly aimed at study work, the broadening of practical knowledge, the exchange of ideas and the improvement of standards within the work of the electricity undertakings.

VERTEENWOORDIGERS OP KOMITEES 3 REPRESENTATIVES ON COMMITTEES

Die Uitvoerende Raad het die ondergemelde lede op die onderskeie komitees benoem:

The Executive Council appointed the undermentioned members to the committees indicated:

3.1

Dagbestuur/Standing Committee

K. G. Robson and his Councillor
P. J. Botes en sy Raadslid
E. de C. Pretorius
J. K. von Ahlften

3.2

Referatekomitee/Papers Committee

K. G. Robson
P. J. Botes

3.3

Finanskomitee/Finance Committee

W. Barnard — Saamroeper/Convenor
J. K. von Ahlften

3.4

Aanbevelingskomitee vir Nuwe Elektriese Verbruiksware
Recommendations Committee for New Electrical Commodities

P. J. Botes — Saamroeper/Convenor
J. A. Loubser

3.5

SABS-IEK Komitee/SABS-IEC Committee

P. J. Botes
J. K. von Ahlften

3.6

Tegniese Opleiding/Technical Training

D. H. Fraser — Saamroeper/Convenor
J. D. Dawson
J. A. Loubser
K. J. Murphy
A. J. van den Berg

3.7

Evkom/Escom

W. Barnard — Saamroeper/Convenor
P. J. Botes
D. H. Fraser
K. J. Murphy
K. G. Robson

3.8

SABS Bedradingsregulasies/Wiring Regulations

A. J. van den Berg — Saamroeper/Convenor
E. de C. Pretorius
J. A. Loubser
. K. von Ahlften
J. D. Dawson — Korrespondent/Correspondent
D. H. Fraser — Korrespondent/Correspondent
K. J. Murphy — Korrespondent/Correspondent

3.9

Elektrolitiese verwering: Streekskomitees
Regional Electrolytic Corrosion Committees

Witwatersrand — W. Barnard — Saamroeper/Convenor
Natal — D. H. Fraser
Noord-Kaapland/Northern Cape — C. Vosloo
Wes-Kaapland/Western Cape — K. J. Murphy

3.10

Electrical Wiremen and Contractor's Act
Wysigingswet op Elektrotegniese Draadwerkers en Aannemers

J. K. von Ahlften
E. de C. Pretorius

3.11

Hoogspannings-Koördinerende Komitee
High-Voltage Co-ordinating Committee

W. Barnard

3.12

Electrical Wiremen's Registration Board
Registrasieraad vir Elektrotegniese Draadwerkers

J. K. von Ahlften — Statutêr/Statutory

3.13

SANCI/SANKV

J. K. von Ahlften

3.14

Wêreld-kragbronkonferensie/World Energy Conference

W. Barnard

3.15

CSIR Advisory Committee for Electrical Engineering
WNNR-Advieskomitee vir die Elektrotegniese Ingenieurswese

W. Barnard

Die verslae van die betrokke komitees wat volg, gee vir u 'n insig in hul werksaamhede. Benewens die bogemelde komitees het die Uitvoerende Raad verskeie sake na ad hoc komitees verwys.

The reports of the committees concerned provide an insight into their activities. In addition to the above committees, the Executive Council referred a number of matters to ad hoc committees.

LIDMAATSKAP

Die stand van die lede van die VMEO op 31 Desember 1978 was soos volg:

4. MEMBERSHIP

4.1 The membership position for the AMEU as at 31st December 1978 was as follows:

Erelede/Honorary Members	32
Voormalige lede/Past Members	31
Ingenieur lede/Engineer Members	93
Geassosieerdes/Associates	24
Assosiaatlede/Associate Members	40
Plaaslike Besture/Local Authorities	149
Geaffilieerdes/Affiliates	110
	479

Doodsberigte 4.2 **Obituaries**

Dit is met diepe leedwese dat die Uitvoerende Raad moet berig dat mnr. R. W. Kane, Erelid en voormalige President, mnr. J. S. Craig, Ingenieurslid, gedurende die tydperk onder oorsig, oorlede is.

It is with deep regret that the Executive Council reports the deaths during the period under review of Mr. R. W. Kane, Honorary Member and Past-President and Mr. J. S. Craig, Engineer Member.

LEDE-BYEENKOMSTE 5 MEMBER MEETINGS

Konvensie 5.1 **Convention**

Die 45ste Konvensie is deur 469 afgevaardigdes en dames vanaf 23 tot 26 Mei 1977 in Oos-Londen bygewoon.

The 45th Convention held in East London from 23rd to 26th May, 1977, was attended by 469 delegates and ladies.

By daardie geleentheid is benewens die openingsrede deur Sy Edele S. P. Botha, L.V. Minister van Arbeid en van Mynwese, en die presidentsrede deur mnr. Ken Robson, ook nog die volgende referate gelewer:

In addition to the opening address by the Hon. S. P. Botha, M.P. Minister of Labour and of Mines, and the presidential address by Mr. Ken Robson, the following papers were read:

"Die Benadering van Ingenieurswese tot Interafhanklikheid in Suider-Afrika" deur Dr. Henry Olivier.

"Engineering for Inter-dependence in Southern Africa" — by Dr. Henry Olivier.

"Verbeterings van Arbeidsproduktiwiteit in Port Elizabeth" — deur mnr. C. E. Adams, Elektrotegniese Stadsingenieur, Port Elizabeth.

"Labour Productivity Improvement in Port Elizabeth" — by Mr. C. E. Adams, City Electrical Engineer, Port Elizabeth.

"Elektrisiteitsvoorsieningstariewe met spesiale verwysings na Johannesburg" — deur mnr. S. G. McCullough, Bestuurdienste Ingenieur, J.E.D.

"Electricity Supply Tariff with special reference to Johannesburg", by Mr. S. G. McCullough, Management Services Engineer, J.E.D.

"Die Bestuur van Verlies veroorsaking" — deur mnr. B. H. L. Leach Assistent-Hoofbestuurder, S. A. Steenkool Olie- en Gas-Korporasie Bpk. Sasolburg.

"The Management of Loss Causation" by Mr. B. H. L. Leach, Assistant General Manager, South African Coal, Oil and Gas Corporation Ltd., Sasolburg.

"Hoogspanningskakeltuig" — deur mnr. H. D. Beck, Adjunk Elektrotegniese Stadsingenieur, Oos-Londen.

"High Voltage Switchgear", by Mr. H. D. Beck, Deputy City Electrical Engineer, East London.

Die Konvensie was in alle opsigte 'n geslaagde byeenkoms.

The Convention was in all respects a successful gathering.

Tegniese Vergadering 5.2 **Technical Meeting**

Die 7de Tegniese Vergadering het op 10 en 11 Mei 1978 te Somerset-Wes plaasgevind. Die ledeforum was baie interessant en leersaam en was weer eens onder die bekwame leiding van Jules von Ahlften en John Morrison gehou.

The 7th Technical Meeting was held at Somerset West from 10th to 11th May, 1978. The members' forum, ably led by Jules von Ahlften and John Morrison, was most interesting and knowledgeable.

Die vergadering is bygewoon deur 275 afgevaardigdes en dames. Referate is deur die volgende sprekers gelewer:

The meeting was attended by 275 delegates and ladies. Papers were delivered by the following speakers:

" 'n Aanvraag-Beherende Huishoudelike Elektrisiteitstarief" — deur mnr. S. H. Hawkeswood, Elektrotegniese Ingenieur, Richardsbaai.

"A demand controlling domestic Electricity Tariff" — by Mr. S. H. Hawkeswood, Electrical Engineer, Richards Bay.

"Die Spesifiseer en Gebruik van Elektriese Kabels" — deur mnr. F. J. Prins, Elektriese Kabelafdeling, SABS.

"Specifying and Using Electric Cable" by Mr. F. J. Prins, Electric Cable Division, SABS.

" 'n Oorsig van moderne elektriese Meterlesingpraktyk" — deur mnr. R. R. Gilmour, Toets en metering ingenieur, Elektrisiteitsafdeling, Kaapstad.

"A review of Modern Electric Metering Practice" — by Mr. R. R. Gilmour, Test and Metering Engineer, Electricity Department, Cape Town.

BUITELANDSE BESOEKE 6 OVERSEAS VISITS

Die 42ste Algemene Vergadering van die IEK is gehou van 6 tot 18 Junie 1977, in Moskou waar mnr. Ken Robson die VMEO verteenwoordig het.

6.1 The 42nd General Meeting of the IEC, was held from 6th to 18th June 1977, in Moscow where Mr. Ken Robson represented the AMEU.

Mnre. D. H. Fraser en J. K. von Ahlften het 'n oorsese studietoer oor nuwe bedradingstelsels meegemaak gedurende Julie 1978.

6.2 Messrs. D. H. Fraser and J. K. von Ahlften undertook an overseas study tour on new wiring systems during July 1978.

PUBLIKASIES

Die verrigtinge van beide die 45ste Konvensie en die 7de Tegniese Vergadering is in boekvorm uitgegee. Daŋksy die ondersteuning van ons adverteerders kon albei publikasies op goeie gehalte papier gedruk word.

Die tydskrif "Munisipale Administrasie en Ingenieurswese" is die amptelike orgaan van die VMEO. Verskeie referate en aangeleenthede van die VMEO is deurlopend in die maandelikse tydskrif gepubliseer.

7 PUBLICATIONS

7.1 The proceedings of both the 45th Convention and the 7th Technical Meeting were published in book form. Thanks to the support of our advertisers both publications could be printed on good quality paper.

7.2 The "Municipal Administration and Engineering Journal" is the official organ of the AMEU. Various papers and matters of the AMEU are regularly published in this monthly magazine.

FINANSIËLE STATE

Die geouditeerde rekeningstate vir die jare geëindig 31 Desember 1977 en 31 Desember 1978 is aan lede uitgestuur.

Die VMEO wens langs hierdie weg sy waardering te betuig aan die ouditeure, mnre. Haasbroek, Smit en Vennote vir hul dienste aan die Vereniging.

8 FINANCIAL STATEMENTS

The audited statement of accounts for the years ending on 31st December, 1977 and 31st December, 1978, were circulated to members.

The AMEU wishes to take this opportunity to thank the auditors, Messrs. Haasbroek Smit and Partners, for their services to the Association.

ALGEMEEN

Hierdie verslag moet saamgelees word met die verskillende komitees en/of verteenwoordigers se verslae. Daar dien vermeld te word dat 'n aansienlike hoeveelheid tyd deur die verteenwoordigers opgeoffer en heelwat werk gelewer is. Die hulp wat aldus verleen word, is van onskatbare waarde vir die VMEO en sy lede en ons betuig namens die lede dank vir daardie onbaatsugtige dienste.

Die Uitvoerende Raad het te alle tye getrag om die belange van die plaaslike besture en sy lede na die beste van sy vermoë te dien. Graag bedank ons ook alle instansies met wie die VMEO 'n noue verbintenis het vir hulle goeie verstandhouding en samewerking.

9 GENERAL

This report should be read in conjunction with the reports of the various committees and/or representatives. The considerable time sacrificed by the representatives and the appreciable amount of work put in by them must specially be mentioned. The aid given in this way is of incalculable value to the AMEU and its members, and on behalf of the members we express our gratitude for the selfless service.

The Executive Council at all times endeavoured to serve the interests of the local authorities and its members to the best of its ability.
We gladly extend our thanks to all organisations with whom the AMEU maintains close contact for their goodwill and collaboration.

BENNIE VAN DER WALT
SEKRETARIS/SECRETARY

MNR. K. G. ROBSON, Oos-Londen

Meneer die President en here, Voorsitter van die Dagbestuur van die Uitvoerende Raad, is dit my voorreg om die aanneming van die verslag van die Sekretaris, mnr. Bennie van der Walt, voor te stel.

'n Besondere hegte verhouding in die werk, sowel as persoonlik, het dwarsdeur my ampstermyn in die daaglikse bedrywighede van die Vereniging tussen die Sekretaris en die President bestaan.

Dit doen my genoeë om in die openbaar te getuig van die uitstekende diens en invloed van ons Sekretaris, mnr. Bennie van der Walt. Sy vermoë en persoonlike eienskappe het 'n aanmerklike invloed op die VMEO gehad. In die kort tydsverloop van ses jaar sedert sy taamlike senu-tergende eerste optrede in Pietermaritzburg, begin hy nou baie soos 'n munisipale elektrotegniese ingenieur te praat en te handel!

Die verslag is die beknopte weergawe van die werk van die VMEO vir die jare 1977/78 en hulde moet gebring word aan die waardevolle werk van die saamroepers, lede en verteenwoordigers in die vele komitees en organisasies — werk wat altyd so gewilliglik onderneem word.

Die Uitvoerende Raad verkies verteenwoordigers vir 15 komitees en amptelike instansies, en die omvang en verskeidenheid van hierdie verteenwoordiging, getuig van die VMEO se belangrikheid in die elektrisiteitsvoorsieningsbedryf in Suid-Afrika.

In the conduct of the affairs of the AMEU it is very evident that the work load on members of the Executive Council, convenors and members of committees is increasing year by year. Of necessity, engineering and technical matters must be dealt with by engineer members, who have their own heavy professional responsibilities, and thereafter passed to the Secretary for administrative processing.

I strongly urge that the incoming executive give careful consideration to the steps which should be taken to ensure that adequate management and administrative resources are provoked to enable the AMEU to carry on its activities effectively in the national interest.

You will be interested to know that, while there have been changes in the numbers of the various classifications, the total membership of 479 is exactly the same as that in 1976.

The four branches are alive and well and provide the real strength of the Association. Tribute to the value and quality of their work must be recorded. However because of their situations a number of member undertakings find themselves excluded from branch activities and it is my opinion that this aspect should continue to receive the attention of the Executive Council. Notwithstanding increasing difficulties, the AMEU has succeeded in maintaining and also establishing international links and this is cause for satisfaction.

The financial statements will be dealt with separately and so I pass over this item.

I would record a special commendation in respect of the journals containing the Proceedings of the previous Convention and Technical Meeting. The Executive Council has been aware constantly of its responsibility to ensure the accuracy of text, both in translation and print — and this is an immense task.

I am pleased to say that with the Proceedings of the 7th Technical Meeting at Somerset West in 1978 a high standard was achieved.

For this we are grateful to Mr Bennie van der Walt, Mr Derek Plowden for editing and proof reading of the English text and Mr Eugene Pretorius for help with the Afrikaans text.

Mention is made in the report of the publicity given in the official journal of the AMEU — "Municipal Administration and Engineering". Most surely this journal — for its quality and content — must be counted amongst the very best publications anywhere dealing with local government.

It has a remarkable editor in the indefatigable, erudite and cultured Mr Robbie Calburn, to whom our praise and thanks are due. To digress for a minute or two — in the January 1978 issue of "Municipal Administration and Engineering" Robbie Calburn wrote a trenchant editorial on the correct use of what he described as "the great and beautiful English language". So for his special benefit I would like to read a protest by the Bishop of Southwark against the modern craze for jargon quoted some years ago by the Bishop of Johannesburg in his diocesan newsletter "The Watchman":

"I am no longer allowed to talk to my clergy", said Bishop Mervyn Southwark. "I have 'to dialogue' with them. If the talks last longer than half an hour the dialogue is 'in depth'.

If I ask for the opinion of a junior curate, I do so because I am 'vulnerable' and feel 'threatened'. And should an argument develop between us, it leads either to an 'exposure situation' or a 'crunch'.

If I ask my secretary to add up three columns of numbers, she cannot give me the answer in a straightforward figure but has to insert the word 'overall' before the figure.

If I am lucky enough to preach a sermon to confirmation candidates that makes sense, I am told it is 'meaningful' and has improved the episcopal 'image'. I used to have a domestics chaplain, but now he is my 'resource' man. I like to think that I am reasonably tolerant in my religious views, but I now have to be 'open ended'.

Well, sir, having indicated my 'area of concern and involvement' I must now start to 'phase out' this letter to you, otherwise my ideas will begin to 'jell' and form a 'bottleneck'. Of course, your younger readers will say that the trouble with me is that I am 'insecure' and am afraid of not 'being accepted'.

I am, sir, if you will allow me to 'spell it out'.

Yours 'meaningfully',

Mervyn Southwark.

It is with pleasure that I now formally move the adoption of the Report of the Secretary.

FINANSIES — FINANCES

MR. W. BARNARD, Johannesburg:

Mr. President, gentlemen, I don't want to take up too much of your time on the report. I think you have all seen the balance sheet for the financial year ending the 31st of December, 1978, and, as usual, we must all agree that the finances of the AMEU are in a very sound position.

We are also aware of the fact that, in addition to the many hats that he wears, our financial manager is also our secretary and I think that we should right at the outset express to him in the usual manner our thanks and appreciation for the excellent way in which he has managed the finances of this Association.

But, Mr. President, gentlemen, I think one must look at this in a little more depth. We have in the past looked at it, and said there is a lot of money in the bank and we are O.K. until next year. I have examined the financial management of other organisations, particularly organisations like the Electrical Engineer's Institute and even overseas organisations and I find that invariably they make the submission that income from both subscriptions and fees should cover running costs, and I have examined the balance sheet on that basis and, for those of you who have not done your arithmetic, I can tell you that on this basis the income is R23 785 and the expenditure is R20 909, giving a nett surplus of R3 876, which I think is a sound position and the Executive Council recommends that the fees and subscriptions remain unaltered for another year.

We must also accept that the Association is in a sound position as far as accumulated funds are concerned, as a matter of fact, these funds are fairly substantial and sometimes one must reflect on the position that we were in five or six years ago, perhaps a little bit longer now, where we had a deficit of the order of R500.

This again is a tremendous achievement and we have to thank all our members of all sorts, engineer members, affiliates and everybody who contributed towards the sound position in which the Association finds itself.

The Executive Council has, therefore, proposed that, as is common in the other institutions and organisations I have mentioned, we should earmark, firtly, a portion of this capital in order that the proceeds from it may be used to finance two bursaries for students who are desirous of reading for the Bachelor of Science Degree in Electrical Engineering at one of the Universities in South Africa. Coupled with this, it is our view that we should appeal to local authorities who have not made provision for bursaries of this nature to seriously consider doing so.

We are aware of the fact that many of the local authorities have made very generous provision and I feel I would fail in my duty if I do not specifically mention Johannesburg, who in fact grants virtually unlimited bursaries for electrical and mechanical engineering and many other professions and also gives bursaries for the technician diploma provided for by technical colleges.

Now, I know this applies also to many other local authorities, but I am told there are some who do not provide bursaries of this nature and we feel we would like to appeal to those authorities to join our ranks in helping us to provide training for more young men to become electrical engineers and so assist to alleviate the acute shortage prevailing today. Even during the recession in Johannesburg we constantly had a shortage of 25% of our electrical engineer requirement.

The second point I would like to make is that the Executive Council also feels that similar funds, or should I say a similar type of fund, should be provided in order that we may make special awards for outstanding per-

formance at the universities, at the technical colleges, and even to those achieving merit in their practical training courses. This is one of the AMEU's main objectives.

And, finally, we would also like to earmark part of this capital which is now available for providing funds for special working groups, investigations, overseas conferences, studies undertaken by engineering members of the AMEU and so on.

I know there was some opposition to this, but I still think that we must establish a working group to consider carefully under what condition solar heating should be enforced or applied at any rate in this country, and possibly also at energy conservation.

With that, Mr. President and gentlemen, and again with our heartiest thanks and congratulations to our Secretary, Mr. Bennie van der Walt, I would ask for the adoption of this report. Thank you.

MR. J. A. LOUBSER, Benoni:

Mnr. die President, terwyl mnr. Barnard gepraat het, het iets in my gedagtes gekom. Dit is in verband met die versoek wat aan ander munisipaliteite gerig moet word om ook by te dra deur byvoorbeeld beurse te gee. Dit is natuurlik ook moontlik dat sekere munisipaliteite te klein is om bv. 'n beurs te gee vir 'n student van sê 'n R1 000 'n jaar, ek noem net 'n voorbeeld. Sou dit moontlik wees dat indien sodanige munisipaliteit besluit om 'n bedrag van sê 'n R100 te gee aan die VMEO, dit te administreer en ook verder te gaan met 'n beurs.

MNR. P. J. BOTES, President:

Dit is 'n uitstekende voorstel, maar ek wonder of die Ordonnansie dit toelaat. Ek betwyfel dit. Ons verwys die saak na die Uitvoerende Bestuur vir verdere aandag.

Nog enige kommentaar? Kan ons dan vra dat die verslag aanvaar word? Baie dankie.

MR. P. J. BOTES, President:

Mr. R. C. Calburn will present the Publicity Report. I don't think I have to introduce him to you, Mr. Robson has done so quite ably.

PUBLICITY REPORT
by MR. R. C. CALBURN

Mr. President, at the 45th Convention of the AMEU, held at East London, the publicity report was presented by Mr. K. G. Robson in his capacity as the Association's Publicity Officer. Since then it has been decided that that report should be presented by me, and not merely replied to by me as was the case at East London.

In now presenting the report, I refer in the first place to the quite splendid volumes of Proceedings, not only of the conventions but of the intermediate two-day meetings, which are produced with remarkable promptitude by your secretary, Mr. Bennie van der Walt. The volume produced after the 1975 Convention had 200 pages and that produced after East London no fewer than 250 pages. Packed with every relevant detail, lavishly illustrated, handsomely produced on what is known in the trade as art paper, and published, I must repeat, with extraordinary speed, these volumes of Proceedings constitute a powerful publicity fillip for the Association. They not only ram home the message of the conventions but also underline the status of the Association.

It is the endeavour of Municipal Administration and Engineering to back up that publicity by keeping the AMEU and its doings in the public eye of local government, and by complementing your secretary's activities. The volumes of Proceedings speak for themselves, but it is the business of M.A. & E. to be more specific and more articulate; for it must be remembered that it is read by councillors and administrators throughout local government as well as by engineers. In this context of articulateness I make no apology for quoting from the Editorial in the June 1977 issue. Having referred to the challenge lying before local government in these times of great change and to the value of a close liaison between it and industry, the writer went on:

"In that climate of thinking the action of the AMEU in including within its constitution affiliate membership for private undertakings in the electrical industry may be seen as prophetic at the time and of increasing significance now.

The part which electricity plays in the national life as a whole and in the private life of every one of us in particular is so complex and far-flung that the average intelligent person would be hard-pressed to give anything approaching full expression of it: it has grown beyond the average individual's realisation. It was therefore a step worthy of close consideration as an example to be followed for a local government body like the AMEU to form this close consultative alliance with the industry with which it has the strongest and widest-spread practical links.

The result is that in this important field of electricity generation, distribution, consumption and administration we have local government being advised and criticised by the electrical industry not as an outsider but as, in an important sense, a member of local government itself.

The infusion of vitality into the AMEU's conferences resulting from this affiliate membership is there for all to see; and that wider preoccupations than merely electro-technological matters result from it is evident from utterances like Mr. Robson's presidential address and Dr. Henry Oliver's paper "Engineering for inter-dependence in Southern Africa" presented at the same conference (and published in our May 1977 issue).

The AMEU has set a very important example. While it would perhaps be invidious to mention them by name, it is legitimate to ask whether there are not other professional local government (and conference-holding) bodies which would do well to follow that example, to the great benefit of local government as a whole. Certain it is that the AMEU, by virtue of its affiliate membership from outside local government, has established for itself an enviable pre-eminence."

That illustrates the endeavours which M.A. & E. sees as being called for from it as the official organ of the Association. Endeavours aimed at keeping the AMEU in the forefront of local government news and bringing its activities to the notice of those in governmental, industrial and other circles who ought to be kept aware of those activities.

In the course of the discussion of Mr. Robson's report, Mr. von Ahlften, suggesting a quarterly Newsletter, observed: "At the moment occasionally one sees an AMEU news item in the Journal" (meaning M.A. & E.) "but this is not very often". In the light of that remark whether or not it was justified, it is quite interesting to see just how much space in M.A. & E. has been devoted to Association matters since the East London Convention. Thus:

June 1977	—	(a) 5¼ pages devoted to the presidential address. (b) a 1½ column leading article on the AMEU. (c) translation of it into Afrikaans — making 3 columns in all of editorial.
July 1977	—	3 pages, illustrated report of the E.L. Convention.
August 1977	—	9½ pages (paper).
January 1978	—	9 pages (paper) (in an issue of only 62 pages).
February 1978	—	newsletter one page.
March 1978	—	6½ pages (paper).
May 1978	—	newsletter 2 pages.
June 1978	—	4½ pages (paper).
July 1978	—	newsletter 2 pages.
August 1978	—	newsletter one page.
September 1978	—	11½ pages (paper) (in an 80-page issue).
October 1978	—	newsletter 2 pages, and paper 2 pages.
December 1978	—	3½ pages (paper).
February 1979	—	7½ pages (paper).

That list speaks for itself, and is included in this report for the record, and also as showing the great importance, from the national and the local government point of view, that the journal which the AMEU has appointed as its official organ recognises as attaching to the promotion of the interests of the Association and to the publicising of its activities.

To the extent that members of the AMEU feel that they would like to see even more about it in the pages of M.A. & E., two factors contribute to the deficiency: first, that more contributions to the Newsletter would be desirable; and, secondly, that a technical journal like M.A. & E. depends for its existence, even though it is a non-profit undertaking, on advertisements, and that advertising space is not, in these times of economic difficulty, always so easy to sell, with the result of smaller issues than are to be desired.

Finally, in the regular monthly feature in the journal entitled "Engineers' Notebook" a special, and specially headed, Electrical section has been introduced. The Executive Council of the Association, correctly in the respectful opinion of the framer of this report, turned down the suggestion that the Electrical section should become directly associated with the AMEU (by the use of the crest or otherwise) — a suggestion made only **de bene esse,** as the lawyers have it; but the fact remains that the new feature does add to the volume of coverage of things electrical in M.A. & E. and thus contributes, though quite indirectly, to the promotion of the AMEU's interests. Hence its mention at the end of this report.

The report is hereby submitted for comment and adoption.

MR. R. C. CALBURN, Publicity Officer:

Mr. President, members of the Executive Council, I beg to present to you the Publicity Report. I don't of course intend to read it but rather to mention some aspects of publicity.

Much has been said about Mr. Bennie van der Walt, but as a professional man I find myself in a unique position, as a humble municipal employee, of giving an official pat on the back of the Mayor of a City. So there I can pat him on the head and say: "Mr. Mayor, well done."

On behalf of this Convention of the AMEU I must commend the standard of the Proceedings which Mr. van der Walt and those who help him produce with such amazing promptitude after each convention or two-day technical meeting. Anyone not in the publishing game perhaps does not realise how much effort is involved in producing it and producing it so quickly and so well. The proceedings are beautifully produced on what is called in the trade "art paper". The convent of every convention or technical meeting is there — every piece of information, published with relatively lightning speed.

I know the trouble other institutions experience. Usually they do not do it so well and much more slowly.

I think that the AMEU should congratulate itelf and congratulate Mr. Bennie van der Walt on a very remarkable effort, which is in relity an effort of publicity. This is to the credit of the AMEU and greatly enhances its prestige. If I may say so respectfully and without patronage — realising that I am talking of the Mayor of Roodepoort, I think it is a damn good job, very well done!

Mr. President I would mention one other item in the report before making one or two small general remarks.

In this report you will see listed the space that has been given to AMEU affairs in Municipal Administration and Engineering. I wish it could have been more.

We live in very difficult times for a journal such as this, non-profit making as it is. It only can subsist by virtue of its advertisements, and the advertising space it sells. The more advertisements the more space for literature; less advertisements, less literature. That perhaps explains why there has not been more AMEU material than there might have been, although I believe we have done justice to the AMEU relative to our total printed content. It has been in my view a generous allocation which we are very pleased to give.

Having said that, may I take this opportunity of making some pointed remarks about the AMEU and this I do, not as your Publicity Officer, but as the editor of this journal. I am a local government commentator and possibly one of the more senior ones in the country.

The AMEU is a very important municipal conference-holding learned body, because of its affiliate membership. I do not think this can be over emphasised. Speaking for local government as a whole I very much hope that the example will be followed.

The Institution of Municipal Engineers for example (I don't know if there are any members present), could benefit immensely if it had an affiliate membership and I cannot see why it should not. I believe this whole concept of affiliate membership which sends local government affairs out into the busy public life is of tremendous value and or local government the particular body which does this.

The Institute of Municipal Treasurers and Accountants could do it very well by bringing in business men as affiliate members through representatives of chambers of commerce and chartered accountants and could add to its prestige and effectiveness. These are but two examples I have given of organisations that could follow the example of the AMEU.

Thank you Mr. President.

CLR. HONIKMAN, Cape Town:

Mr. President, thank you very much for this opportunity for speaking. I have really nothing to say, except perhaps to thank you for this opportunity and to compliment you on your appointment. To thank you also for having made this latter part of the proceedings intelligable and enjoyable for those of us who are hard of hearing. I think we have all enjoyed very much being able to listen to one another, even if we are a little bit old and antiquated.

Mr. Chairman, to have come all the way from Cape Town and to say nothing is perhaps a bit of an offence to this organisation and certainly would not justify my having come all this distance. I have to go back and certainly have to justify my presence here and the word publicity appears to have given me that opportunity.

Now, it reminded me so much of a man who is very well known to the whole of Cape Town and perhaps further afield. I speak of Bishop Lavis. I wonder if you have heard of him? He was a man who endeared himself to every citizen of Cape Town and in fact was the first freeman of the City of Cape Town. Bishop Lavis was so much beloved that, wherever he went, people whether they knew him or not, raised their hats and bowed to him. I remember one day when I was in office in Cape Town, I was walking along the corridor towards the banquet in the hall when the lift (not the "elevator") stopped at the floor just at the moment I reached there. The door opened and out walked Bishop Lavis. Ah, he said, 'My dear Mr. Honikman and what am I doing here?" This is what reminded me of my presence here today — what am I doing here? He fumbled for a moment and he looked beneath his frock coat for his diary and just then the Chairman of the organisation whose function we both were supposed to attend, appeared on the scene and said "Gentlemen this way", and he rushed us into the banqueting hall. Bishop Lavis was still fumbling and I said: "You know Bishop Lavis I think you are about to open an advertising consultant's conference this morning." He said: "Me, the Bishop, advertising consultants! I think there is a mistake." The President then went up to the dias and he said to his audience: "Ladies and Gentlemen you hav'nt come to hear me this morning, you have come to hear Bishop Lavis declare this conference open." Bishop Lavis, still fumbling, went up to the dais and said — "Ladies and Gentlemen, my very dear friend Mr. Honikman has only this moment told me that I am about to open an advertising consultants' conference." He said — "What does a Bishop say to advertising consultants?, I believe that my Secretary has let me down, and so she has; I should be at an Anglican Church Conference this morning." He said — "Now, what does a Bishop say?" and he pondered for a moment, you could hear a pin drop, and then he said this: "The carp fish lays a 1 000 eggs, the hen lays only 1 but the carp fish does not cackle when its noble work is done and so we all admire the hen, and the carp fish we despise and it all only goes to show that it pays to advertise."

Thank you mr. President for enabling me to go back to Cape Town having justified my presence here.

MR. P. J. BOTES, President:

Thank you Clr. Honikman for a most enjoyable contribution.

SABS PROGRESS REPORT

During the past two years a fair number of projects have been finalised as can be seen from the schedule.

Very few problems were encountered, but a meeting on cross-linked polyethelene cables (project No. 0761/5006) convened by me for the benefit of the users was severely criticized, but not so the meetings on the subject held by the users. Due to different view points on the subject, further investigations are being conducted, which can only be to the benefit of users and manufacturers.

Because of an urgent appeal by Johannesburg City Council, Project No. 0761/5021 (Combined neutral/earth (CNE) 600/1 000 V cables) is being speeded up by the issuing of a draft document for comment in English only, whilst the Afrikaans version is being prepared.

With regard to Project No. 0781/5015 (Safety requirements for electrical appliances) the AMEU Standing Committee endorsed a decision by our representative Mr. G. C. Theron, to press for a safety mark on consumer appliances.

I must draw your attention to the fact that no progress was made on project No. 0721/5016 (Street lighting luminaires).

I wish to take this opportunity to thank the personnel of the SABS for the important work they do, their dedication to the task and their co-operation. I also wish to thank the AMEU representatives for their part and all the Councils for allowing their engineers to participate towards standardization.

SABS VORDERINGSVERSLAG

Gedurende die afgelope twee jaar is 'n redelike aantal projekte afgehandel soos duidelik blyk uit die skedule.

Baie min probleme is ondervind maar 'n vergadering oor kruisgebonde poliëtileen kabels (projek 0761/5006) wat deur my belê is tot voordeel van verbruikers is sterk gekritiseer, alhoewel dit nie die geval was met die vergaderings oor dié onderwerp wat deur die verbruikers belê was nie. As gevolg van verskillende sienswyse oor die onderwerp word verdere ondersoek gedoen wat slegs tot voordeel van verbruikers en vervaardigers sal wees.

Weens 'n dringende versoek deur Johannesburg Stadsraad word projek 0761/5021 (Gekombineerde neutraal/ aard (CNE) 600/1 000 V kabels) versnel deur die daarstelling van 'n konsep dokument vir kommentaar in Engels alleen terwyl die Afrikaanse weergawe nog voorberei word.

Wat betref projek 0781/5015 (Veiligheidsvereistes vir elektriese toestelle) het die VMEO Dagbestuur 'n besluit van ons verteenwoordiger mnr. G. C. Theron, deur aan te dring op 'n veiligheidsmerk op verbruikerstoestelle, bekragtig.

U aandag word daarop gevestig dat geen vordering met die projek 0721/5016 (Straatligarmature) gemaak is nie.

Ek maak graag van hierdie geleentheid gebruik om die SABS personeel te bedank vir die belangrike werk wat hulle doen, hulle toegewydheid tot hulle taak en hulle samewerking. Ek wil ook die VMEO verteenwoordigers bedank vir hulle bydrae en al die Stadsrade wat hulle ingenieurs toelaat om by te dra tot standaardisasie.

P. J. BOTES
REPRESENTATIVE/VERTEENWOORDIGER
SABS/IEC SUB-COMMITTEES/SUB KOMITEES

SABS PROGRESS REPORT/SABS VORDERINGSVERSLAG
1977-01-01 — 1978-08-31

PROJ. No.	ONDERWERP/TITLE	VERTEENWOORDIGER REPRESENTATIVE	VERSLAG/REPORT
0771/5023	Switchboard instruments. Skakelbord instrumente.	G. R. Marloth	Document finalized. SABS to circulate. Dokument gefinaliseer. SABS sal dit uitstuur.
0751/5005	Wall and appliance switches. Muur en toestelskakelaars.	J. A. Loubser	Standard specification completed and published as SABS 163-1978. Standaard spesifikasie afgehandel en gepubliseer as SABS 163-1978.
0751/5015	Electrical Distribution Boards: Part 1: Architrave type for flush mounting on indoor walls. Part 2: Surface type for mounting on indoor walls. Elektriese Verdeelborde Deel 1: Lystipe vir gelykvlak montering teen binnemure. Deel 2: Oppervlaktipe vir montering teen binnemure.	J. A. Loubser	Completed. Awaiting approval by SABS Council. Draft specification circulated for comments. Voltooi. SABS Raad moet goedkeur. Konsepspesifikasie uitgestuur vir kommentaar.
0751/5006	Two-pole and earthing-pin plugs and socket-outlets. Twee-pool en aardingspen kontakproppe en sokuitgange.	J. A. Loubser	SABS preparing a draft for comments. Another meeting will be called after receipt of comments. SABS verei konsepspesifikasie voor vir kommentaar. Na ontvangs van kommentaar sal nog 'n vergadering gehou word.

There is one final touch your product needs to make it sell.

The final touch is recognition.
A small identifying seal that has become the criterion of comparison for purchases everywhere.
The SABS seal of quality.
It instantly establishes that your product is tested and maintained to superior specifications.
It turns the point of sale into the point of conviction.

122

SABS Setting the standards.

Enquiries to the Director General, SABS, Private Bag X191, Pretoria 0001.

KMP 3420

0751/5009	Plugs, socket-outlets and computers for industrial purposes. Kontakproppe, sokuitgange en verbinders vir nywerheidsdoeleindes.	J. A. Loubser	Specification to be submitted to SABS Council for approval. Spesifikasie word aan SABS Raad voorgelê vir goedkeuring.
0751/5010	Wall outlet boxes (for 20 mm conduit). Muuruitgangkaste (vir 20 mm leipype).	J. A. Loubser	SABS Standard specification 1085—1978 already published. SABS Standaardspesifikasie 1085—1978 reeds gepubliseer.
0791/5001	The protection of structures against lightning. Die beveiliging van strukture teen weerlig.	J. A. Loubser	Code of Practice SABS 03-1976 being revised, several sub-sections are being considered. Gebruikskode SABS 03-1976 word hersien en verskeie onderafdelings word in die vooruitsig gestel.
0791/5015	Insulation co-ordination. Koördinering van isolering.	J. K. von Ahlften E. de C. Pretorius I. F. Boyack E. H. Scholes J. C. Strauss D. M. Fraser	Draft Code of Practice prepared on 15 June 1978. Konsep Gebruikskode voorberei op 15 Junie 1978.
0761/5006	XLPE Cables. XLPE Kabels.	P. J. Botes A. H. L. Fortman E. de C. Pretorius	Draft specification discussed at meetings held on 18 January and 7 February 1978. Konsep spesifikasie bespreek by vergaderings gehou 18 Januarie en 7 Februarie 1978.
0751/5002	Graphical symbols for electrical diagrams. Grafiese simbole vir elektrotegniese diagramme.	E. de C. Pretorius	No progress. Geen vordering.
0761/5004	General Co-ordinating Committee (Cables). Algemene Koördinerende Komitee (Kabels).	G. C. Theron	No progress. Geen vordering.
0781/5001	Standing advisory committee on electrical safety. Vaste komitee vir elektriese veiligheid.	G. C. Theron	Revision of levies on compulsory schedules 1 and 6. Increases approved as interim measure. Will be reconsidered within 12 months with a report regarding better control and possible test case. Heffings op verpligte skedules 1 en 6 hersien. Verhogings goedgekeur as tussentydse maatreëls. Sal in 12 maande heroorweeg word met verslag oor beter beheer en moontlike toetssaak.
0781/5015	Safety requirements for electrical appliances. Veiligheidsvereistes vir elektriese toestelle.	G. C. Theron	Two meetings, the one on compulsory safety specifications and the other on the discussion of levies and enforcement of safety specifications. It has been decided to press for a safety mark on consumer appliances. Twee vergaderings, een oor verpligte veiligheidspesifikasies die ander oor bespreking van heffings en toepassing van veiligheidspesifikasies. Daar is ook besluit om aan te dring op 'n veiligheidsmerk op verbruikerstoestelle.
0721/5015	Interior luminaires. Binneshuise armature.	R. S. Yates	SABS Specification No. 1119. SABS Spesifikasie Nr. 1119.
0721/5016	Streetlighting luminaires. Straatligarmature.	R. S. Yates	No progress. Geen vordering.
0761/5008	Conductors for overhead electrical transmission lines. Geleiers vir bogrondse elektriese verspreidingslyne.	D. Briers	Parts 1, 2 and 3 published. Dele 1, 2 en 3 reeds gepubliseer.
0761/5011	Part 4: Copper clad steel conductors. Deel 4: Koper oorgetrekte staalgeleiers.	D. Briers	Draft being circulated for comments. Konsep word gesirkuleer vir kommentaar.

0761/5013	Part 5: Galvanised steel conductors. Deel 5: Gegalvaniseerde staalgeleiers.	D. Briers	Draft being circulated for comments. Konsep word gesirkuleer vir kommentaar.
0771/5022	Busbars (Copper and Aluminium). Geleistamme (Koper en Aluminium).		Draft approved. Will be submitted to SABS Council for approval and publication. Konsep goedgekeur. Sal aan SABS Raad voorgelê word vir goedkeuring en publikasie.
0771/5006	Cartridge type fuse links for low and medium voltage electric fuses. Patroontipe sekeringskakels vir lae- en mediumspanning elektriese sekerings.	A. H. L. Fortman	Finalised and published. Gefinaliseer en gepubliseer.
0761/5012	The selection, handling, installation and operation of electric power cables up to and including 22 kV rating. Die keuring, hantering, installering en bediening van elektriese kragkabels tot en met 22 kV.	P. J. Botes	Good progress being made. Goeie vordering word gemaak.
0761/5005	Crimped or pressure type connectors. Gekartelde of drukaansluiters.	V. A. Raynal	Little progress, SABS conducting tests. Weinig vordering, SABS besig met toetse.
9641/5001	Control of electrostatic hazards in anaesthetizing and similar localities. Die beheer van elektrostatiese gevare in verdowings- en soortgelyke lokale.	C. A. Anderson	Committee at present considering amendments to SABS 051. Komitee oorweeg tans wysigings tot SABS 051.
0791/5016	Insulation co-ordination (High voltage). Koördinering van isolering (Hoëspanning.	I. F. Boyack	Second draft considered June 1978. Tweede konsep oorweeg Junie 1978.
0791/5025	Overhead transmission lines. Bogrondse verspreidingslyne.	E. H. Scholes	No progress. Geen vordering.
0791/5017	Distribution transformers. Verspreidingstransformatore.	I. F. Boyack	No progress. Geen vordering.
0771/5004	Moulded case circuit breakers. Stroombrekers met gevormde hulse.	F. J. van der Merwe	Project completed, refer SABS 156/1977. Projek afgehandel, verwys SABS 156/1977.
0771/5009	Core balance earth-leakage protection units. Aardlekbeveiligingseenhede van die stroombalanstipe.	J. A. Loubser F. J. van der Merwe G. C. Theron	Document to be circulated for comments. Dokument sal uitgestuur word vir kommentaar.
0771/5020	Contactors Kontaktors.	F. J. van der Merwe	Project completed, refer SABS 156/1977. Projek afgehandel, verwys SABS 156/1977.

0751/5008	Wiring trunkings and skirtings. (i) Metallic wireways for wall or ceiling mounting. (ii) Metallic wireways for installation in floors. (iii) Non-metallic wireways. Bedradingsroetering en vloerlyste. (i) Metaal draadleidings vir muur of plafonmontering. (ii) Metaal draadleidings vir installering in vloere. (iii) Nie-metaal draadleidings.	J. J. Boshoff	Section (i) submitted to SABS Council for approval. Section (iii) First meeting on 11 August 1978. Deel (i) aan SABS Raad voorgelê vir goedkeuring. Deel (iii) Eerste vergadering op 11 Augustus 1978.
0851/5007	Screwed conduit and fittings for electrical wiring. Skroefleipype en toebehore vir elektriese bedrading.	J. J. Boshoff	SABS 1007: Finalised and published in 1973. SABS 162: Draft of revised specification sent out with closing date for comments as 1 May 1977. No further action. SABS 1007: Afgehandel en gepubliseer in 1973. SABS 162: Konsep van hersiene spesifikasie uitgestuur vir kommentaar met sluitingsdatum as 1 Mei 1977. Geen verdere vordering.
0381/5017	Non-metallic flexible conduit. Nie-metaal buigbare pype.	J. J. Boshoff	No progress. Geen vordering.
0721/5002	Public lighting (Part 1). Openbare verligting (Deel 1).	J. K. von Ahlften	No progress. Geen vordering.
0721/5005	Ballasts for high-pressure mercury vapour and low-pressure sodium vapour discharge lamps. Ballaste vir hoëdruk kwikdamp en laedruk sodiumdamp ontladingslampe.	J. K. von Ahlften	Draft issued for comments 25 September 1978. Konsep uitgereik vir kommentaar 25 September 1978.
0721/5007	Public lighting (Part 2). Openbare verligting (Deel 2).	J. K. von Ahlften	No progress. Geen vordering.
0721/5013	Code of Practice for interior lighting, Part 5 — Artificial lighting. Gebruikskode vir binnenshuise verligting, Deel 5 — Kunsmatige verligting.	J. K. von Ahlften	No progress. Geen vordering
0761/5051	Electrotechnical Nomenclature. Elektrotegniese Benamings.	J. K. von Ahlften	No progress. Geen vordering.
0761/5022	Specification for land mobile communication equipment. Spesifikasie vir mobiele kommunikasie-uitrusting vir landgebruik.	M. W. Odendaal	Meetings on 14 and 15 September 1977 to discuss draft specification. Vergaderings op 14 en 15 September 1977 om konsepspesifikasie te bespreek.
0711/5022	Impulsing energy regulators for electric heating units. Impulsenergie reguleerders vir elektriese verhittingseenhede.	L. B. Cumming	First meeting on 27 September 1977. Work still to be completed. Eerste vergadering op 27 September 1977. Werk moet nog afgehandel word.

0791/5020	Hardware for transmission lines including earth rods. Metaalware vir verspreidingslyne insluitend aardstawe.	W. J. Baker	First draft has been discussed, second draft being prepared. Eerste konsep reeds bespreek, tweede konsep word voorberei.
0721/5012	Capacitors for fluorescent and discharge lamp ballasts. Kapasitors vir gebruik by fluoresseer- en ander ontladingslampe.	A. J. v.d. Berg	English version of document circulated for comment. Afrikaans version forwarded to Technical Section for checking and should be ready for submission to the first meeting in 1979. Engelse weergawe van dokument uitgestuur vir kommentaar. Afrikaanse teks by Tegniese Nasien en behoort by vergadering in 1979 voorgelê te word.
0761/5003	Heat resisting cables for use in the internal wiring of electrical appliances. Hittebestande kabels vir gebruik in die interne bedrading van elektriese toerusting.	A. J. v.d. Berg	Specification to be revised. New document to be submitted to SABS Council early in 1979. Spesifikasie moet hersien word. Nuwe dokument sal vroeg in 1979 aan SABS Raad voorgelê word.
0781/5011	Electric storage water heaters. Elektriese opgaarwaterverwarmers.	A. J. v.d. Berg	Completed. Afgehandel.
0781/5019	Thermostats for electric storage water heaters. Termostate vir elektriese opgaarwater verwarmers.	A. J. v.d. Berg	Completed 1974. Afgehandel 1974.
0781/5021	Immersion heaters for portable appliances (Rev. of SABS 185-1960). Dompelverwarmers vir draagbare toestelle (Hers. SABS 185-1960)	A. J. v.d. Berg	Revision of specification. New document to be submitted to SABS Council in 6 months. Hersiening van spesifikasie. Nuwe dokument sal aan SABS Raad binne 6 maande voorgelê word.
0781/5023	Immersion heaters for electric storage water heaters. Dompelverwarmers vir elektriese opgaarwaterverwarmers.	A. J. v.d. Berg	Busy with specification. Besig met spesifikasie.
0341/5034	Cathodic Protection Katodiese Beskerming	L. D. M. de Wet	Approved by SABS Council, 9 June 1977. Goedgekeur deur SABS Raad, 9 Junie 1977.
0361/5028	Insulating oil for transformers and switchgear. Isoleerolie vir transformatore en skakeltuig.	V. A. Raynal	Amendment No. 1, 23 August 1978. Wysiging Nr. 1, 23 Augustus 1978.
0361/5043/5048	Sampling of coal and preparation of a sample for analysis Part I: Sampling of coal. Part II: Preparation of a sample for analysis. Keuring van kole en voorbereiding van 'n monster vir ontleding Deel I: Keuring van kole. Deel II: Voorbereiding van 'n monster vir ontleding.	G. T. Stevens	Part I: Approved by Council, 24 August 1977. Part II: Approved by Council, 24 August 1977. Deel I: Goedgekeur deur SABS Raad, 24 Augustus 1977. Deel II: Goedgekeur deur SABS Raad, 24 Augustus 1977.

0361/5008	The sampling and methods of analysis of solid fuels. (a) Methods of test 921-930, 932, 933. (b) Methods of test MMM, OOO and PPP. (c) Method NNN. (d) Methods JJJ, QQQ, SSS and TTT. Keuring van metodes van vaste brandstof. (a) Toetsmetodes 921-930, 932, 933. (b) Toetsmetodes MMM, OOO en PPP. (c) Toetsmetode NNN. (d) Toetsmetodes JJJ, QQQ, SSS en TTT.	G. T. Stevens	(a) Approved by Council, 7/6/1978. (b) Being finalised for approval by Council. (c) Pending the outcome of an investigation will also be finalised. (d) Circulation for consumers and comments received will be discussed on 31 October 1978. (a) Goedgekeur deur SABS Raad, 7/6/1978. (b) Word gefinaliseer vir goedkeuring deur SABS Raad. (c) Afhangend van die uitslag van 'n ondersoek sal dit gefinaliseer word. (d) Gesirkuleer vir kommentaar, Kommentaar wat ontvang word sal op 31 Oktober 1978 bespreek word.
0751/5001	Code of Practice for the wiring of premises (SABS 142-1978). Gebruikskode vir die bedrading van persele (SABS 142-1978).	E. de C. Pretorius J. K. von Ahlften J. A. Loubser A. J. v.d. Berg P. J. Botes	Completed. Approved by Council, 8 march 1978. Afgehandel. Goedgekeur deur Raad, 8 Maart 1978.
0711/5018	The installation of aerial systems (communal and single) for the reception of VHF and UHF sound and television broadcasts. Die installasie van antennastelsels (gemeenskaplik en enkel) vir die ontvangs van VHF en UHF klank- en televisie-uitsendings.	A. H. L. Fortman	Comments discussed on 14 March 1978. Draft being prepared for approval by Council. Kommentaar op 14 Maart 1978 bespreek. Konsep word voorberei vir goedkeuring deur Raad.
0721/5012	Ballasts for fluorescent lamps. Ballaste vir fluoreseerlampe.	P. J. Botes	No activity. Geen aksie.
0751/5007	Electrical terminals and connectors. Part I: Screw terminals Elektriese aansluiters en verbinders. Deel I: Skroefaansluiters.	K. J. King	Divided into three parts in August, 1977. Verdeel in drie dele in Augustus 1977.
0761/5014	System protection and control cables. Sisteembeskerming en beheerkabels.	P. J. Botes	No progress. Geen vordering.
0761/5021	Combined neutral/earth (CNE) 600/1 000 V cables. Gekombineerde neutraal/aard (CNE) 600/1 000 V kabels.	P. J. Botes	A draft document is only issued for comment in the original language in which it was prepared. Konsepdokument sal slegs in oorspronklike taal waarin dit opgestel is vir kommentaar binnekort vrygestel word.
0771/5010	Busbar trunking. Geleistam roetering	P. J. Botes	Meeting on second committee draft held on 23 August 1977. Tweede komitee konsepvergadering gehou op 23 Augustus 1977.
0771/5011	Three-phase induction motors, Part 1. Driefasige induksie motore, Deel 1.	P. J. Botes	Being prepared for approval by Council. Word voorberei vir goedkeuring deur Raad.
0771/5016	Three-phase induction motors, Part II. Driefasige induksie motore, Deel II.	P. J. Botes	Awaiting comments, closing date 15 November 1978. Wag vir kommentaar, sluitingsdatum 15 November 1978.
0771/5026	Single-phase alternating current motors. Enkelfasige wisselstroom motore.	H. J. de Bruin	Being prepared for approval by Council. Word voorberei vir goedkeuring deur Raad.

0781/5016	Lampholders and bayonet cap lamp-holder adaptors. Lamphouers en bajonet-dop lamphouerpasstukke.	G. C. Theron	Being prepared for approval by Council. Word voorberei vir goedkeuring deur Raad.
0781/5038	Electric stoves, hot-plates and similar appliances. Elektriese stowe, kookplate en soortgelyke toestelle.	J. H. Davies	Being prepared for comment. Word voorberei vir kommentaar.
0791/5008/5009	High and low voltage bushings. Insulators for standard bushings. Hoë- en laespanning deurvoerders. Isoleerders vir standaard deurvoerders.	M. W. Odendaal	In preparation for approval by Council as one specification, SABS 1037. Word voorberei vir goedkeuring deur Raad as een spesifikasie. SABS 1937.
0791/5011	Ceramic and glass insulators for overhead lines of nominal voltage greater than 1 000 V. Keramiek en glas isoleerders vir bogrondse lyne met 'n nominale spanning van meer as 1 000 V.	M. W. Odendaal	Amendment No. 2 being prepared. Wysiging Nr. 2 word voorberei.
0791/5012	Low voltage insulators of ceramic, glass and synthetic insulating materials. Laespanning isoleerders van keramiek, glas en sintetiese isoleermateriaal.	L. Dreyer	In abeyance (Requirements for plastic materials uncertain). Word agterweë gelaat (Vereistes vir plastiekmateriaal is nog onbekend).
0791/5018	Power Transformers. Kragtransformatore.	I. F. Boyack	Draft not yet prepared. Konsep nog nie voorberei.
0791/5022	Surge arrestors. Stuwingsweerders.	H. D. O. van Oppel	Being prepared for comment. Word voorberei vir kommentaar.
0791/5028	Earth rods. Aardstawe.	G. H. Dawes	Being prepared for comment. Word voorberei vir kommentaar.
0791/5029	Earthing. Aarding.	G. H. Dawes	Being prepared for comment. Word voorberei vir kommentaar.
0811/5028	The installation, testing and balancing of duct works for air conditioning. Die installering, toets en balanseer van pypleidings vir lugversorging.	D. E. T. Potgieter	Being prepared for comment. Word voorberei vir kommentaar.
0851/5068	Luminaire entries and spigots (SABS 1088—1978) Armatuur inlate en tappe (SABS 1088—1978).	H. J. de Bruin	Approved by Council 8 March 1978. Goedgekeur deur Raad 8 Maart 1978.

MNR. J. K. VON AHLFTEN, Springs:

Meneer die President, kan u miskien aan ons die redes versterk hoekom u sterk gekritiseer is met die vergadering wat u belê het vir kruisgebonde poliëtileen kabels terwyl dit nie die geval was met die ander vergaderings nie.

Kan u miskien ook aandui wat die reaksie was deur aan te dring op 'n veiligheidsmerk op verbruikerstoestelle. Ek vertrou dat mnr. Smit van die SABS moontlik iets oor die aangeleentheid wil sê.

Dan laastens meneer die President, kan u ons miskien 'n aanduiding gee hoekom daar geen vordering met projek 0721/5016 (straatlig-armature) gemaak is nie. U sal onthou dat hierdie saak reeds tydens die 1972 Tegniese Vergadering in Kempton Park ter sprake gekom het.

MNR. P. J. BOTES, President:

Mnr. von Ahlften jy vra vir mens moeilike vrae. Jy weet daar is twee kante aan 'n saak. Daar is die kant van die vervaardiger en daar is die kant van die, sal ons dit noem die gebruiker. Dit is nie noodwendig dat ons ooreenstem met sake nie. Ek moet sê, daar is heelwat verskille.

Nou het dit so gekom dat vergaderings belê is deur vervaardigers om 'n Standaardspesifikasie op te stel vir Kruisgebonde poliëtileen kabels. Toe ek 'n vergadering belê waar net gebruikers teenwoordig sal wees, was ek heelwat gekritiseer omdat ek dit gedoen het. Ek dink die sakie is taamlik opgevolg. As gevolg van dié twee uiteenlopende standpunte, word daar nou sekere toetse deur EVKOM gedoen, ek dink onder leiding van die Evkom, een of ander toetssentrum, en ek dink dit sal goeie vrugte afwerp, maar wat nou gedoen word, die verskille wat daar was, word nou prakties beplan.

Ek dink dit beantwoord u vraag in daardie verband.

In verband met die ander twee vrae wil ek mnr. Smit van die S.A.B.S. vra om te antwoord.

MNR. SMIT, S.A.B.S.:

Die verslag dek die periode 1 Januarie 1977 tot 31 Augustus 1978. Sedert laasgenoemde datum was daar steeds aansienlike vordering maar a.g.v. gebrek aan tyd sal ek verkies om, waar moontlik, liewer op spesifieke vrae te antwoord as om die vorderingsverslag op datum te probeer bring.

Die volgende projekte verdien egter toeligting:

(a) **Spesifikasie vir Kruisgebonde Poliëtileenkabels (0761/5006).**
Die Buro het reeds af die nodige werk i.v.m. piktoetse en vragsiklustoetse afgehandel en wag slegs vir 'n opening in die Apollo-toetslaboratorium om ook die nodige kortsluittoetse te doen voordat die inligting aan die komitee voorgelê word.

(b) **Spesifikasie vir Gekombineerde neutraal/aard kabels (0761/5021).**
Die dokument is afgehandel en sal op ons Raadsvergadering op 6 Junie 1979 vir goedkeuring voorgelê word.

(c) **Veiligheidsvereistes vir Elektriese Toestelle (0781/5015).**
'n Veiligheidsmerk op elektriese toestelle volgens verpligte spesifikasies is vir die Buro op hierdie stadium nie prakties uitvoerbaar nie. Eerstens moet daarop gelet word dat elektriese toestelle volgens wetsbepaling veilig moet wees anders word 'n wetsoortreding by die verkooppunt begaan. Dit volg dus dat 'n elektriese veiligheidsmerk ("sticker"/plakker) om tussen veilige en onveilige toestelle te onderskei, **onnodig** is.

Tweedens sal so 'n veiligheidsmerk as 'n onderskeidingsmerk van die SABS deur die betrokke Minister voorgeskryf moet word. Volgens verklaarde gebruik is die merk slegs toepaslik op Suid-Afrikaans vervaardigde toerusting. Die voorgestelde merk sou dus nie op ingevoerde toestelle gebruik kon word nie.

Omdat meeste Suid-Afrikaanse produkte onder die SABS merkskema vervaardig word en dus in elk geval aan die veiligheidspesifikasies moet voldoen, lê die probleem juis meer by ingevoerde produkte.

Die Buro wil dus sterk aanbeveel dat die VMEO sy ondersteuning vir 'n veiligheidsmerk op hierdie stadium in hersiening neem.

(d) **Straatligarmature (0721/5016).**
'n Konsepdokument vir bespreking deur die komitee is reeds opgestel.

Tydens die kommentaarvergadering van die komitee vir ballaste vir laedruk-natriumdamp- en hoë intensiteitsontladingslampe het hierdie komitee versoek dat 'n spesifikasie vir binne-armature vir ontladingslampe opgestel word as 'n saak van dringendheid. Aangesien die vereistes van die straatligarmatuur-spesifikasie en die spesifikasie vir binne-armature vir ontladingslampe grootliks dieselfde sal wees en verder omdat vloedverligtingsarmature, waarvoor die nodigheid van 'n spesifikasie nou ook duidelik geword het, ook grotendeels uit oorvleueling bestaan, stel die Buro voor dat hierdie drie spesifikasies gelyktydig deur een komitee afgehandel word. Dit sal onnodige duplisering uitskakel en na ons mening 'n geweldige tyds- en kostebesparing bewerkstellig. Die finale spesifikasie sal dan uit drie dele bestaan (of verkieslik drie spesifikasies binne dieselfde omslag) en twee hiervan sal grotendeels uit verwysing na die eerste spesifikasie bestaan.

'n Vergadering waarop hierdie voorstel bespreek sal word, word vir 19 April 1979 belê en op hierdie vergadering sal die drie konsepspesifikasies beskikbaar wees vir besprekings indien die komitee ons voorstel gunstig oorweeg.

In a lighter vein, gentlemen — some remarks about the report itself. Mr Botes is to be congratulated on giving you such a comprehensive report. I will let you in on the secret. My secretary prepared it for him and he only effected changes where he felt that we had disguised the lack of progress by the use of innocent phrases. To illustrate, gentlemen, on project 0721/5010 Ballasts for fluorescent lamps, we reported that the specification was approved by Council on 8 June 1977. Furthermore on project 0721/5012, Capacitors for fluorescent and discharge lamp ballasts, we reported that the draft was being prepared for approval by Council. In the report in front of us today we find on page 6 project 0721/5012 listed as Ballasts for fluorescent lamps and the comment "No activity". I was indeed surprised, gentlemen.

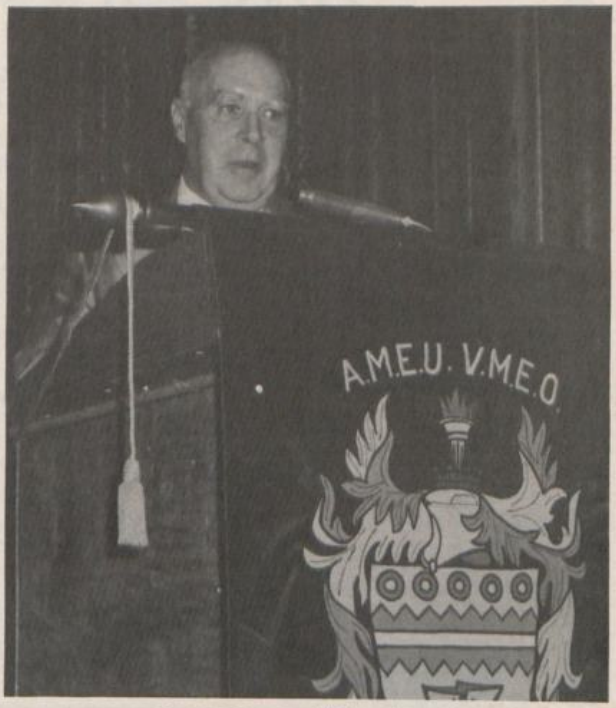
There are quite a few more of these surprises in the report. I do not intend to comment on them now, but I cannot resist however mentioning just one more — perhaps in the hope of precipitating an argument (or shall we call it a discussion) which may serve a very useful purpose. On page 5 the report on 0721/5002 and 0721/5007, Public lighting Parts I and II respectively, reads "No progress". Both codes of practice have been completed and published many years ago. We did not include these two projects in our report and I can't help wondering why the report tabled today stresses that there was no progress. Is it perhaps because of CIE Publication No. 12. Perhaps Mr von Ahlften would comment.

Finally, we have heard a lot about ripple control and load shedding this morning. I feel that it is time that we invent ripple control for speakers at conventions and do some load shedding on behalf of the audience at appropriate times. I shall therefore not tax your patience any further.

MNR. P. J. BOTES, President:

Baie dankie mnr. Smit, vir jou kommentaar. Nou, sover dit die veiligheidsmerk aanbetref, dit is vir ons 'n saak van erns en ek dink ons behoort daaroor iets te sê.

Ek wonder of mnr. Theron wie ons verteenwoordiger is graag iets wil sê.



Mnr. G. C. Theron spreek die Konvensie toe.

MNR. G. C. THERON, Vanderbijlpark:

Meneer die president, ek hoop my "jogging" daar van bo was vinniger as mnr. Smit s'n.

In verband met hierdie saak meneer die President, dames en here, is daar samesprekings gevoer om te kyk of daar 'n oplossing vir hierdie probleem is. Nou, ek kan u ongelukkig nie veel meer sê as wat mnr. Smit vir u gesê het nie.

Soos u reeds genoem het, toe u my geroep het om iets te om sê, is dit 'n saak van baie groot erns by die VMEO se lede, en ook die verbruikers.

Op die laaste vergadering waar die verbruikers, vervaardigers, invoerders en die VMEO was, was hierdie ding baie deeglik bespreek en as gevolg daarvan en die inligting wat op daardie stadium beskikbaar was, is toe aangebring op die voorsiening van so 'n veiligheidsmerk.

Sedertdien het ander inligting tot ons gekom op 'n volgende vergadering wat mnr. Smit my megedeel het, in April belê sal word om hierdie saak verder toe te lig aan die afgevaardigdes by daardie vergadering. Ek dink dat as gevolg van hierdie inligting wat nou beskikbaar geraak het, ons liewer die resultate van die volgende vergadering in April moet afwag en dan daarna weer besin oor die hele aspek.

Ek dink ons kan nie op hierdie byeenkoms nou 'n verdere beslissing daaroor neem nie.

Dankie meneer die President.

MNR. P. J. BOTES, President:

Baie dankie mnr. Theron. Ek dink dit is 'n baie goeie voorstel.

Stem u almal saam daarmee? Goed.

Mnr. Theron tree vandag offisieel af as Elektrotegniese Ingenieur van Vanderbijlpark.

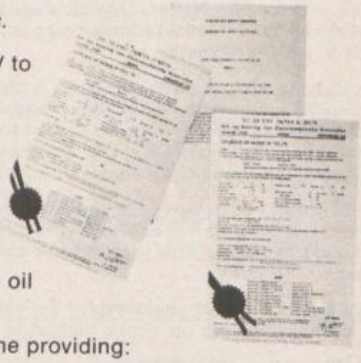
Ek kan net noem dat ons besluit het om nog van sy dienste gebruik te maak op hierdie komitees en dat ons hom heraangestel het. Baie dankie vir u samewerking en vir wat u in die verlede vir hierdie komitee gedoen het.

Ek wil darem net aan mnr. Smit sê dat ek nie sy verslag slaafs navolg nie. Ek vra van elke ingenieur 'n verslag aan en vanuit die twee verslae tot my beskikking, kan ek kies en keur om my eie verslag op te stel. Dit is hoe dit gedoen word.

TOMORROWS SWITCHGEAR AVAILABLE TODAY IN R.S.A.

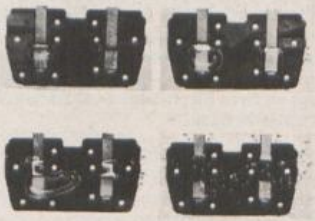
Consider the advantages the Yorkshire SOHI range of H.V. Switchgear gives you now — and in the years to come.

- O.C.B.s — Switches and fuse switches all compatible for multipanel switchboards.
- All units up to 1250 AMPS on *470mm centres.*
- Tested and certified for use on systems 6,6kV to 15kV-250MVA to 20kA-BSS and IEC respectively. (17,5kV insulation level.)
- O.C.B. certified to latest U.K. standards — BS5311:1976.
- Type test approved by U.K. electricity supply industry.



- Operating mechanism housed in O.C.B. tank keeping it tamperproof — in oil atmosphere and away from pollution.
- O.C.B. mechanism/moving contact system mounted on withdrawable frame providing: Easy inspection — Quick interchangeability — Minimum shutdown time.
- No secondary contacts.

- All O.C.B. trucks equipped to accept motors for recharging mechanism operating springs.
- Separate arcing and main contacts ensure full O.C.B. capacity always available. Even after most arduous fault operating conditions.
- A unique short circuit endurance performance by the caton arc-trap allows programmed/ reduced maintenance following fault clearances. The following duty cycle can be performed WITHOUT oil change or maintenance.



FAULT LEVEL	13,1kA	8,0kA	4,0kA	1,3kA	TOTAL
BREAKS	20	30	60	150	260
MAKES	10	15	30	75	130

All that plus two bonuses: It's very competitive. It's readily available from our factory in Pinetown.

The man who buys for today goes bankrupt tomorrow.
The engineer who buys for today isn't doing his job.
(OLD YORKSHIRE PROVERB)

YORKSHIRE SWITCHGEAR S.A. (PTY) LTD.
P.O. Box 157
PINETOWN
NATAL
Telephone 72-1501
Telex 6-5094SA

Distributed by

Reunert & Lenz Ltd
10 Anderson Street
P.O. Box 92 Johannesburg 2000
Telephone 836-1351

Branches in all main centres.

MR. P. J. BOTES, President:

Gentlemen may we now go onto the next report, that of the SABS Committee on: "Revision of Standard Regulations for the Wiring of Premises."

I think we will deal first with the report on Working Group 4, of the Main Committee (Revision of Wiring Regulations) submitted by A. J. van den Berg. Wil u graag iets byvoeg mnr. van den Berg?

Dit lyk vir my daar is geen bespreking nie.

Die volgende een is die Werkgroep 3 deur mnr. J. A. Loubser. Dealing with the comments of the IEC T.C. 64. Any comments?

MNR. E. DE C. PRETORIUS, Potchefstroom:

Meneer die President, 'n maand of wat gelede het daar 'n omsendbrief gekom van die VMEO waar die lede geadviseer is dat die nuwe Gebruikskode geïmplementeer sal word op 'n datum wat deur die Uitvoerende Raad aanbeveel word. Kan u vir ons meer informasie in daardie verband gee? In verband met die datum van die implementering van die nuwe Gebruikskode. Dankie.

MNR. P. J. BOTES, President:

Daar was 'n voorstel, ek dink dit was aanvaar deur die Uitvoerende Bestuur, dat ons dit op 1 Julie implementeer saam met die ander, die ou Bedradingswet, en dan vanaf die 1ste Januarie 1980 die nuwe Kode aanvaar, ek dink dit was die gevoel gewees.

WYSIGINGSWET OP ELEKTROTEGNIESE DRAADWERKERS EN AANNEMERS — WERKGROEP 3

Verskeie vergaderings van die Departement van Arbeid is sedert die 1977 Konvensie bygewoon om die voorgestelde konsep wysigingswet op Elektrotegniese Draadwerkers en Aannemers te bespreek. Ingevolge die opdragte van die Wiehahn Kommissie na arbeidswetgewing in Suid-Afrika, wat onder andere die Wet op Elektrotegniese Draadwerkers en Aannemers (Wet No. 20 van 1939 soos gewysig) insluit, was dit egter nie moontlik om met die voorgestelde wysigingswet voort te gaan alvorens die bevinding van die Kommissie bekend gemaak is nie. Met die skrywe van hierdie vorderingsverslag was daar nog geen amptelike aankondiging wanneer die bevinding van die Kommissie bekend gemaak sou word nie.

ELECTRICAL WIREMEN'S & CONTRACTOR'S AMENDING ACT — WORK GROUP 3

The Department of Labour has met a number of times since the 1977 Convention to discuss the proposed draft Electrical Wiremen & Contractor's Amending Act. In accordance with the terms of reference of the Wiehahn Commission's enquiry into labour legislation in South Africa, which includes inter alia, the Electrical Wiremen & Contractor's Act (Act No. 20 of 1939 as amended), it has however, not been possible to proceed with the draft amending act as the findings of the Commission must first be published. At the time of writing this progress report, no official announcement as to when the findings of the Commission are to be made known, has yet been issued.

J. K. VON AHLFTEN
VERTEENWOORDIGER/REPRESENTATIVE

VERSLAG OOR DIE BEDRYWIGHEDE VAN DIE REGISTRASIERAAD VIR ELEKTROTEGNIESE DRAADWERKERS

By die voorlegging van dié verslag aan die 1979-konvensie moet melding gemaak word van die feit dat geen verslag aangebied kan word ten opsigte van 1978 nie, aangesien die datum van die konferensie verskuif is na Februarie 1979 en alle verslae teen 28 September by die sekretarisse ingedien moes wees.

Besonderhede van die jaar se bedrywighede van die Raad word eers in Februarie van die volgende jaar beskikbaar.

Die Registrasieraad vir Elektrotegniese Draadwerkers is vir 1977/78 soos volg saamgestel:

Mnr. A. A. Weich
Voorsitter — Departement van Arbeid.

Mnr. A. C. L. Elisio
Vakbond vir Elektrotegniese Draadwerkers.

Mnr. G. W. A. Scandling
Vakbond vir Elektrotegniese Draadwerkers (net vir 1977).

Mnr. J. K. von Ahlften
VMEO.

Mnr. D. F. Kneale
EAV

Mnr. C. P. de Leeuw
Departement van Arbeid

Mnr. C. H. Hare
C.O.T.T. (in raadgewende hoedanigheid)

Mnr. A. D. de Kock
Sekretaris.

JAARVERSLAG VIR 1977

Die Sekretaris van die Raad het soos volg verslag gedoen oor die bedrywighede van die Registrasieraad vir Elektrotegniese Draadwerkers in 1977:

"Die Raad het in 1977 tien vergaderings gehou en 946 aansoeke om re-

REPORT ON THE ACTIVITIES OF THE ELECTRICAL WIREMEN'S REGISTRATION BOARD

In submitting this report to the 1979 Convention mention must be made of the fact that no report can be submitted in respect of 1978 as the date of the Convention has been brought forward to February 1979 and all reports had to be submitted to the Secretaries by 28 September 1978.

Details of the annual activities of the Board only become available during February of the following year.

The Electrical Wiremen's Registration Board was constituted as follows for 1977/78:

Mr. A. A. Weich
Chairman — Department of Labour

Mr. A. C. L. Elisio
Trade Union for Electrical Wiremen

Mr. G. W. A. Scandling
Trade Union for Electrical Wiremen (only for 1977)

Mr. J. K. von Ahlften
AMEU.
Mr. D. F. Kneale
ECA

Mr. C. P. de Leeuw
Department of Labour

Mr. C. H. Hare
C.O.T.T. (In an advisory capacity).

Mr. A. D. de Kock
Secretary.

ANNUAL REPORT FOR 1977

The Secretary of the Board has reported as follows on the activities of the Electrical Wiremen's Registration Board during 1977:

"The Board held 10 meetings during 1977 and considered 946 applications for registration. Of this number 923 persons were either

gistrasie oorweeg. Van dié getal is 923 òf aanvaar vir die Raad se eksamens òf vrygestel van die geheel of gedeeltes van die eksamens. Die Raad het ook voorwaardelike registrasie-sertifikate uitgereik aan, of die hernuwing van sodanige sertifikate goedgekeur vir 1 083 aansoekers. Altesame 326 aansoekers se aansoeke is afgewys.

Drie geskrewe eksamens is by 40 eksamensentrums afgeneem en 1 752 kandidate is tot die toetse toegelaat. Die uitslag was soos volg:

accepted for the Board's examinations or were exempted from the whole or parts of the examinations. The Board also granted provisional registration certificates or approved the renewal of such certificates in respect of 1 083 applicants. The applications of 326 applicants were refused.

Three written examinations were held at 40 examination centres and 1 752 candidates were accepted for the tests, the results being as follows:

Deel 1/Part 1 (Bedradingsregulasies (Standard regulations for the wiring of premises)

Druip/Failed	667
Slaag/Passed	321

Deel 2/Part 2 (Elektriese teorie/Electrical theory)

Druip/Failed	215
Slaag/Passed	62

Afwesig van eksamens/Absent from examinations

Parts 1 and 2/Dele 1 en 2	487
Totaal kandidate/Total candidates	1 752

'n Paar van die kandidate wat om verskeie redes nie die geskrewe eksamens kon aflê of slaag nie, is toegelaat om mondelinge toetse te doen.

In die jaar is 344 praktiese eksamens in die 10 hoofsentrums afgeneem. Toetse is gereël vir 1 830 kandidate van wie 408 geslaag het en 1 134 gedruip het terwyl 288 nie by eksamens opgedaag het nie.

Van die 1 134 kandidate wat in die praktiese eksamen gedruip het, het 'n aantal in sekere take geslaag en is gevolglik daarvan vrygestel in die daaropvolgende eksamen. Die slaagpunt vir elke afsonderlike taak is 60 persent. Die bogenoemde totale van 1 752 en 1 830 sluit kandidate in wat in vorige jare gedruip het.

Verder is sewe tydelike sertifikate van beperkte omvang in die jaar aan leerling-leipypbedraders uitgereik.

Besonderhede van registrasiesertifikate wat sedert die Wet in werking gestel is, uitgereik is, word hieronder aangegee:

A number of candidates who, for various reasons, were unable to undergo or pass the written examinations, were allowed to take oral tests.

During the year, 344 practical examinations were held in the 10 principal centres. Tests were arranged for 1 830 candidates of whom 408 passed and 1 134 failed while 288 absented themselves from the examinations.

Of the 1 134 candidates who failed in the practical examinations a number passed in certain tasks and in the following examination they were exempted from such tasks. The pass-mark for each individual task is 60 percent. The above-mentioned totals of 1 752 and 1 830 include candidates who had failed in previous years.

A further seven temporary certificates of limited scope were issued to learner conduit installers during the year.

Particulars of registration certificates issued since the Act came into operation are reflected hereunder:

Jaar/Year	Applicants exempted from exams/ Aansoekers met vrystelling	Applicants who passed in 1977 or previously Aansoekers wat die eksamens in 1977 of in voorafgaande jare geslaag het	Totals/ Totale
1940—1972	3 091	8 994	12 085
1973	55	549	604
1974	31	495	526
1975	18	406	424
1976	11	433	444
1977	18	370	388
TOTALE/TOTALS	3 224	11 247	14 471

Besonderhede van die getal voorwaardelike registrasiesertifikate uitgereik in die laaste vyf jaar (met uitsluiting van hernuwings daarvan) is soos volg:

Particulars of the number of provisional registration certificates issued over the last five years (excluding renewals thereof) are as follows:

Jaar/Year	Getal/Number
1973	810
1974	680
1975	608
1976	416
1977	316

Daar moet op gewys word dat sekere van die syfers wat hierbo genoem is, voorlopig is, maar dit kan as goeie weerspieëling van die werklike posisie aanvaar word.

It should be noted that certain of the figures mentioned above are preliminary figures but they can be accepted as giving a good reflection of the actual position.

ALGEMEEN

In die lig van die groot getal druipelinge in die eksamens, wat meebring dat die Bedryf baie draadwerkers verloor, en ook in 'n poging om wanpraktyke te beperk, het die Registrasieraad vir Elektrotegniese Draadwerkers nou 'n registrasiesertifikaat van beperkte omvang daargestel wat uitgereik word aan mense wat òf erkende vakleerlingskappe voltooi het, òf in 'n eksamen getoon het dat hulle 'n sekere mate van vaardigheid bereik het in bedradingswerk. Die houers van sulke sertifikate mag draadwerk doen slegs onder die leiding van ten volle gekwalifiseerde draadwerkers wat ook verantwoordelik gehou word vir die werk wat gedoen is.

GENERAL

In view of the high rate of failures in the examinations, resulting in many wiremen becoming lost to the Industry, and also in an effort to curb malpractices, the Electrical Wiremen's Registration Board has introduced a registration certificate of limited scope which is issued to persons who have either served recognised apprenticeships or who have gained sufficient practical experience and have proved by way of examination that they have attained a certain degree of proficiency in performing wiring work. The holders of such certificates may do wiring work only under the direction of fully qualified wiremen who are held responsible for the work done.

Die Raad verwys na sulke werkers as assistentdraadwerkers en, sedert die Raad in Julie 1977 begin het om sulke sertifikate van beperkte omvang uit te reik, is altesame 83 sertifikate tot aan die einde van 1977 uitgereik.

Benewens die vergaderings wat hierbo genoem is, is 'n spesiale vergadering van die Raad gehou om voorgestelde wysigings aan die Wet, wat deur die Departement opgestel is, te bespreek. Die vergadering is bygewoon deur uitvoerende lede van die organisasies wat in die Raad verteenwoordig word sowel as deur verteenwoordigers van die Federasie van Staal- en Ingenieursnywerhede van Suid-Afrika. Hoewel 'n groot mate van konsensus bereik is oor die voorgestelde wysigings, het die Departement besluit om in die lig van die aanstelling van die Kommissie van Ondersoek na Arbeidswetgewing wat ook die Wet op Elektrotegniese Draadwerkers en Aannemers ondersoek, nie met die voorgestelde wetsontwerp voort te gaan nie."

Such workers are referred to by the Board as assistant wiremen and, since the Board commenced issueing such certificates of limited scope during July 1977, a total of 83 certificates were issued by the end of 1977.

Apart from the meetings mentioned above, a special meeting of the Board was held to discuss proposed amendments to the Act which were drawn up by the Department. The meeting was attended by executive members of the organisations represented on the Board as well as representatives of the Steel and Engineering Industries Federation of South Africa. Although a good measure of consensus was reached on the proposed amendments, the Department decided not to proceed with the proposed Bill in view of the appointment of the Commission of Inquiry into Labour Legislation which is also investigating the Electrical Wiremen and Contractor's Act."

J. K. VON AHLFTEN
VERTEENWOORDIGER/REPRESENTATIVE

WERKGROEP 3 VAN DIE S.A.B.S. HOOFKOMITEE

Net soos IEK TC 64 nog baie werk het om af te handel, netso het Werkgroep 3 nog baie werk om te doen. Dit lyk asof daar 'n nimmereindigende stroom van dokumente vanaf die Sekretariaat ontvang word vir bespreking en kommentaar. Die Suid-Afrikaanse komitee is maar 'n klein groepie en dikwels lyk dit asof die verskillende internasionale werkgroepe weinig of geen aandag aan ons kommentaar gee nie, maar gelukkig is daar darem ander kere wat die aanbevelings wat ons maak aanvaar en netso in die dokumente opgeneem word.

Sedert die vorige verslag van u verteenwoordiger gelewer is, is daar nege vergaderings gehou wat gewoonlik die heeldag geduur het.

Onder andere is die volgende dokumente bespreek en kommentaar daarop gelewer:

(CO) 50: Beskermingsmaatreëls teen elektriese skok.

(Sec) 174 en 222: Kanaliserings.

(CO) 49: Beveiliging teen oorstroom.

(Sec) 181 en (CO) 68: Aarding en beskermingsgeleiers.

(Sec) 180, 223 en 224: Beskerming teen brand.

(Sec) 184: Klassifisering van noodtoevoerstelsels.

(Sec) 186: Skakeltuig en kontrole toerusting.

(Sec) 187: Buitengewone aardingsvereistes vir data prosesseringstoerusting.

(Sec) 176 en 217: Riglyne op veiligheidsreëls vir die installering van verhittingstelsels en toerusting.

(Sec) 199 en 228: Vereistes van skakeling vir veiligheid.

(Sec) 198 en 226: Identifisering van geleiers.

(Sec) 197: Stroomdravermoë van kabels.

(Sec) 225: Veiligheids- en bystandstoevoere.

(CO) 67A, 67 en 68: Voorlopige publikasie 364: Deel 5: Keuse en oprigting van elektriese toerusting.

(CO) 66 en Sec 227: Seksie 311: Beraming van maksimum aanvraag.

(CO) 69: Konvensionele g.s. spanningsbeperking.

Hierdie is maar net enkele van die items wat behandel is, en, indien dit vergelyk word met die vorige verslag, sal daar gemerk word dat heelwat van die items weer en verder bespreek is.

Die vorige vergadering van TC 64 is deur ons destydse President, mnr. K. G. Robson, te Moskou bygewoon en ten tye van die skrywe van hierdie verslag is daar nog nie besluit of die Uitvoerende Raad 'n afvaardiging na die volgende TC 64 vergadering gaan stuur nie. Daar is egter nog baie werk oor en ek hoop daar word besluit om wel 'n afvaardiging te stuur. Dit sal gedurende Mei 1979 te Sydney, Australië, plaasvind.

Weer eens, my dank aan mnr. J. V. Grant van die S.A.B.S., wat as ons Voorsitter optree en aan mnre. Everitt en Jochelson, die ander lede van hierdie werkgroep.

WORKING GROUP 3 OF THE S.A.B.S. MAIN COMMITTEE

Just as IEC TC 64 still has a lot of work to dispose of, so has working group 3 still a lot of work to do. It seems as if a never ending stream of documents is being received from the Secretariat for discussion and comments. The S.A. Committee is only a small group and often it appears as if the various international working groups afford very little or no attention to our comments. Fortunately however, there are the times when recommendations which are made by us are adopted and incorporated into the documents.

Since the previous report was presented by your representative, nine meetings have taken place which usually lasted the whole day.

Amongst others, the following documents were discussed and comments presented thereon:

(CO) 50: Measures of protection against electric shock.

(Sec) 174 and 222: Canalisations.

(CO) 49: Protection against overcurrent.

(Sec) 181 and (CO) 68: Earthing and protective conductors.

(Sec) 180, 223 and 224: Protection against fire.

(Sec) 184: Classification of emergency supply systems.

(Sec) 186: Switchgear and controlgear.

(Sec) 198: Special earthing requirements for data processing equipment.

(Sec) 176 and 217: Guide on safety rules for installation of heating cables and heating products.

(Sec) 199 and 228: Requirements for switching for safety.

(Sec) 198 and 226: Identification of conductors.

(Sec) 197: Current-carrying capacity of cables.

(Sec) 225: Safety and stand-by supplies.

(CO) 67A, 67 and 68: Draft-publication 364 Part 5: Selection and erection of electrical equipment.

(CO) 66 and Sec 227: Section 311: Estimation of M.D.

(CO) 69: Conventional voltage limit for d.c.

These are only a few of the items which were dealt with and if compared with the previous report, it will be observed that a considerable number of items were further discussed.

The previous meeting of TC 64 was attended by the then President, Mr. K. G. Robson in Moscow and at the time of writing this report, no decision had been reached as to whether the Executive Committee will be sending a delegation to the next 64 meeting. There is still a lot of work left to be done and it is only hoped that the Executive Committee will see its way clear to sending a delegation to the next meeting which will be held in Sydney, Australia, during May, 1979.

Once again, my thanks to Mr. J. V. Grant of the S.A.B.S. who chaired our meetings and Messrs. Everitt and Jochelson, the other members of this working group.

J. A. LOUBSER
VERTEENWOORDIGER/REPRESENTATIVE

SABS BEDRADINGSKODE — HERSIENING VAN BEDRADINGSREGULASIES WERKGROEP 4

Daar is op 13 Julie 1977 'n vergadering van die Hoofkomitee wat aangestel is om die Bedradingsregulasies te hersien by die SABS gehou om die saamgestelde kommentaar op die konsep te bespreek. Vervolgens is 'n vergadering van die Hoofkomitee belê om die volgende aspekte te bespreek:

Document No. 51 (WG 4): .....

Document No. 52 (WG 4): .....

Document No. 53 (WG 4): .....

Document No. 54 (GUIDE): .....

Soos voorheen gemeld sal 'n SABS spesiale komitee nou in die toekoms die funksies van die huidige komitee vir aanbeveling insake nuwe elektriese ware van die VMEO oorneem.

In 'n skrywe met datum 18-4-1978 ontvang vanaf die SABS oor die nodigheid al dan nie vir 'n Bedradingskode: 'n Handleiding vir Draadwerkers, het die verteenwoordigers van die VMEO gevoel dat 'n Handleiding vir Draadwerkers onnodig en oorbodig skyn te wees.

Werkgroep 4 het dan ook op drie geleenthede, nl. op 7-9-1977, 4-8-1977 en 16-3-1978, vergader om aangeleenthede te bespreek.

Volgens 'n woordvoerder van die SABS sal die finale Bedradingskode in albei tale om en by gedurende Desember 1978 beskikbaar wees.

SABS WIRING CODE — REVISION OF WIRING REGULATIONS WORKING GROUP 4

A meeting of the Main Committee appointed to revise the Wiring Regulations was held at the SABS on 13th July 1977, for the purpose of discussing the various comments received on the draft. A meeting of the Main Committee was thereafter arranged to discuss the following matters:

Authorization of New Techniques.

Authorization of New Techniques. Information concerning applications for authorization.

"Recommendations", "Approvals" and Suppliers' codes of practice.

Wiremen's Guide.

As previously stated, a special committee of the SABS is to replace the existing committee of the AMEU and this new committee will submit recommendations in regard to new electrical equipment.

Commencing on a letter dated 18th April 1978, from the SABS in connection with the necessity of a Guide for Wiremen, the AMEU representatives felt that such a Guide was unnecessary.

Working Group 4 also discussed this matter at meetings held on 7-9-1977, 4-8-1977 and 16-3-1978.

According to a spokesman for the SABS the final version of the Wiring Code will be available in both official languages during December 1978.

A. J. VAN DEN BERG
SAMEROEPER — SABS-KOMITEE
CONVENOR — SABS COMMITTEE

MNR. P. J. BOTES, President:

Dames en here, op versoek van mnr. Weich en mnr. von Ahlften het ons dit goedgevind om mnr. Weich aan die woord te stel om sy verklaring te doen oor die **"Verantwoordelikhede van die Elektrotegniese Ingenieur."**

Mnr. Weich is 'n baie ou bekende by ons. Ons waardeer die samewerking wat ons van hom verkry en ek stel nou mnr. Weich aan die woord.

MR. A. WEICH, Chief Inspector of Factories:

1. Basically the Act is designed to protect the health and safety of the worker and to do this the legislature has made the rules and has decreed that it will be the responsibility of the employer to comply with the rules and has provided for penalties which may be imposed in the event of an employer being found to have contravened the provisions or regulations. The Act is not unique in this respect as some would want to argue because it is a principle deeply entrenched in commen Law for which there are numerous verdicts handed down by the courts. The Legislature in South Africa has therefore just affirmed the common law position by the enactment of the Factories Act and other related Acts.

2. Both in common and statute law a local authority must accept a legal responsibility, or rather duty, for the safety of its employees. In common law the duty is general whilst in statute law the duty is specific. It brings about civil and criminal responsibility and a failure to comply therewith could constitute a breach of the service contract. Workmen could legitimately refuse to operate or work in dangerous circumstances or, for example, operate defective machinery and, to this end, seek the assistance of a court. However, the legislator so effectively covered the particular area of responsibility and, in certain respects, strengthened it, that very little reference is indeed made to common law. The local authority, as employer, therefore cannot comply with the general and specific legal duty by merely appointing responsible and competent persons in terms of the Factories, Machinery and Building Work Act.

3. Section 40 of the Factories Act is therefore the critical part which spells out that the employer may be convicted for contraventions of provisions of the Act by its managers or other employees and throughout the Act it will be noticed that, with few exceptions, the onus of complying with the provisions of the Act rests with the employer. In the case of local government, represented by the majority of delegates to this Conference, the municipalities are the employers. Municipalities employ officials to run its affairs and thus place responsibilities on the shoulders of these officials. The city or town electrical engineer is a very important official in the employ of a municipality and to him is entrusted the spending of large sums of money and the control and direction of subordinate employees. The engineer cannot evade these responsibilities and neither can he evade responsibility under the Act because he cannot accept and enjoy a position of authority without also carrying the burden of the responsibilities attached to the post! Authority and responsibility go hand in hand.

4. The Act recognises the fact that employers, whether they be occupiers of a factory, users of machinery or builders or excavators cannot always personally attend to matters in connection with compliance of the legal requirements of the Act and the Regulations; in fact the employers may not even be technically qualified and capable of complying with the law. Therefore, in order to ensure that the fulfillment of the requirements of the Act and the Regulations is placed in capable hands, the law requires that the employer must appoint a responsible person who is qualified to attend to these matters and who may also be held responsible under the Act.

5. In the case of local government, a municipality will appoint one of its employees to accept these legal responsibilities but very often it is the level of authority at which this responsibility is placed that reveals a complete lack of understanding of the Act by these local authorities. Not only do municipalities sometimes show this ignorance but this is also displayed by senior municipal officials. Too often it is found that comparatively junior officials in management positions or persons in even lower supervisory ranks are appointed in terms of the requirements of the Act. The municipality feels that it have done its duty and senior management, who advised the appointment of junior staff members, considers that it is safe from prosecution should anything go wrong.

6. A municipality will look to its engineer for assistance in formulating policy and will certainly hold him responsible for carrying out that policy. It will further hold him responsible for the actions of his subordinates, execution of all works and for monies spent. Should anything go wrong in the electrical engineer's department the municipality will in the very first place expect the engineer to explain. The common primary responsibility is therefore placed with those vested with the highest authority and not with employees in the lower echelons, and why should the legal responsibilities be placed any lower?

7. For the actual execution of its function the city electrical department makes use of normal management techniques in that the staff

structure under the engineer and the lines of communication from the engineer ensure that the work is done. Responsibilities are delegated further down the line in keeping with the degree of authority vested in assistants, but delegated responsibilities are not divested responsibilities, and as long as the electrical engineer accepts his position of authority, with the privileges associated therewith, he will be shackled to his responsibilities, even those which he had delegated to subordinates.

8. It is now necessary to answer the question of where the responsibilities, imposed by the Act on the municipality, should be placed. These legal responsibilities are no less onerous than those common responsibilities placed on the municipality by the requirements of the rate-payers and it is therefore logical to assume that the municipality will not delegate these responsibilities any lower than it delegates all its other responsibilities. Just as the municipality will call the engineer to account for a breakdown of municipal services, more-so will council call to account the engineer for an accident which may have resulted in a fatality caused by a contravention of a legal requirement which may carry a penalty of imprisonment or a stiff fine!

9. The Act also recognises that the affairs of local government are conducted by means of the normal management techniques of delegation of responsibility and makes it possible for competent persons, who are subordinate to the responsible person, to be appointed to be responsible for certain things without relieving the person placed in general charge of his overall responsibilities. The Act therefore makes it possible for any organisation to function in the normal manner and does not require a different managerial structure for discharging the legal obligations from that which is set up for all other purposes.

10. Because he cannot evade the responsibility in any case the engineer should, in addition to the responsibilities imposed by his normal duties, also accept the responsibilities of the responsible person under the provisions of the Act, but it is necessary to examine the question of delegation of responsibility and try to answer the question: How far can, and how much of this responsibility may be delegated down the line to subordinate staff. What does the term "responsible person" mean?

    For the purpose of the Act "Responsible Person" has two distinct distionary meanings, viz. a person capable of rational conduct and a person liable to be called to account. Rational conduct can only be expected of persons who have the necessary experience and knowledge and accountability could be considered to be directly proportional to the authority vested in a person.

11. Although frequent and regular contact with the area of responsibility is necessary, direct personal supervision of the work by the responsible person is not always possible nor is it intended. By insisting that detail work be supervised by the responsible person himself is often to derate the quality of the person who can be made available for the purpose. The degree of supervision is then increased at the cost of the quality of the supervision and could quite easily be carried to a point where the supervision is technically completely incompetent, thus defeating the object of the various regulations. Greater benefit can be extracted from a responsible person who is of good quality and in a corresponding position of authority than vice versa and the tendency of users, builders and excavators to make token appointments at levels of inferior competence is deplored.

12. It is therefore the opinion that responsibility, in terms of the Act, must be allowed to rest with those high up in any organisation who are in the best position to ensure that the provisions of the regulations are satisfied and that the method of ensuring that this is done is determined by the normal management functions. Responsibility is not a part-time business, but being responsible on a full-time basis must not be confused with being actively engaged on the legal duties only on a full-time basis; it is accepted that responsible persons shall have other duties as well.

13. It is therefore obvious that the responsible person in general charge should not allow his responsibilities to be delegated beyond the point where he can be sure that his instructions and policies will be intelligently carried out by persons who have authority, knowledge and experience and who can be expected to be able to exercise effective supervision over the work. However, it would be futile to try to define exactly how far and to what extent responsibilities should be delegated.

This decision itself is one of the inescapable burdens of those people in positions of authority and must be borne together with all the others. In closing I would like to point out to you that the hierarchy of responsibility is as old as history and quote the Roman Centurien, Luke Chapter 7, where he said "For I also am a man set under authority having under me soldiers, and I say unto one, Go and he goeth, and the other come and he cometh, and to my servant, Do this, and he doeth it!

MNR. P. J. BOTES, President:

Baie dankie mnr. Weich.

Is daar enige vrae in dié verband? — Mnr. Barnard van Johannesburg.

MR. W. BARNARD, Johannesburg

Mr. President, I am the last one who wants to cross swords with the Chief zinspector; I respect him far too much for that, and I must accept everything he says. Nevertheless I have a legal opinion which casts tremendous doubt on his statement that he can prosecute our most vulnerable secretary here today. In fact, I would like to know in terms of what regulation or legislation he can find the definition of the employer being the mayor of any city or town.

As a matter of fact, I think he has deliberately hedged the issue, because I have not yet been able to find the legal man who con define for me the employer in local authority.

MR. A. WEICH, Chief Inspector of Factories:

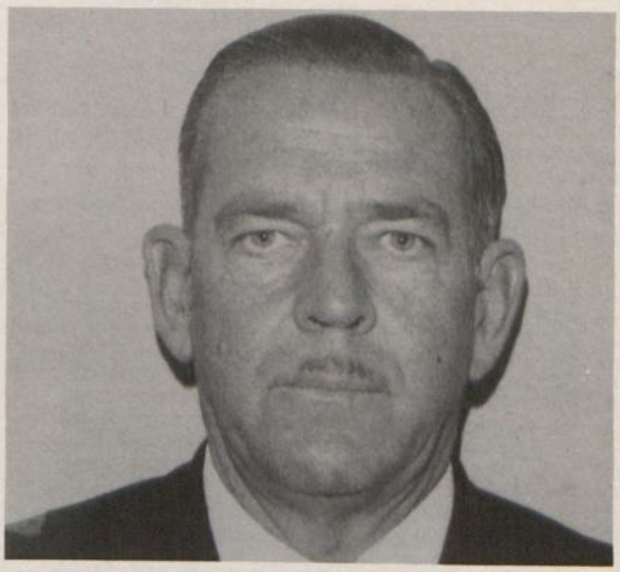
Mr. President, Mr. Barnard is quite correct, I use it as a figure of speech that the legal person representing the organisation, (and that is not the mayor, I admit), can be prosecuted. It is more probably the Town Clerk who would be charged, but this has not, as yet, occurred.

In a case of companies, of course, we have charged a lot of directors to date. But Mr. Barnard is correct, I just used it as a figure of speech to illustrate that the employer can be held responsible. In a similar way the employer could be sued and could be fined quite a large sum of money.

MNR. P. J. BOTES, President:

Ladies and gentlemen, any further questions?

Blykbaar is daar geen. Dit is blykbaar alles baie duidelik. Mnr. Weich ons dank u. Die samewerking wat die VMEO van mnr. Weich ontvang het, word baie hoog waardeer.



MNR. JULES VON AHLFTEN

MNR. J. K. VON AHLFTEN, Springs:

Meneer die President, ek wil u net daarop wys dat afgesien van 'n Handleiding vir Draadwerkers, die VMEO se verteenwoordigers ook die mening huldig dat 'n algemene handleiding vir Installasie Inspekteurs oorbodig is.

Dit is elke "voorsiener" se eie reg en verantwoordelikheid om hieroor te besluit en kan nie as algemene reël aan "voorsieners" voorgeskryf word nie.

Meneer die President, ek het doelbewus nie verwys na die kommentaar van die VMEO wat op versoek van die Wiehan Kommissie oor die Wet op Elektrotegniese Draadwerkers en Aannemers aan die kommissie voorgelê is, aangesien daar nog geen amptelike aankondiging oor die bevindinge van die Kommissie bekend gemaak is nie.

Ek mag egter noem dat mnr. Pretorius en ek deur die Uitvoerende Raad benoem was om namens die VMEO op versoek van die Kommissie ons kommentaar verder mondelings toe te lig wat op 1 Mei 1978 plaasgevind het.

Kortliks kan die VMEO se sienswyse as volg opgesom word:

1. Aangesien die definisie van "masjinerie" soos omskryf in die fabriekswet ook "draadwerk" insluit kan die vereistes rakende die veiligheid daarvan asook die registrasie van draadwerkers moontlik in die fabriekswet opgeneem word en kan die bestaande wetgewing dus hierdeur vervang word.

2. In die lig hiervan kan die "gebruiker" van masjinerie soos in fabrieke waar 'n verantwoordelike persoon aangestel is, verantwoordelik gemaak word vir die toets van hulle eie draadwerk onderhewig aan die voorsiener se reg van inspeksie. Nieteenstaande die amptelike vertolking wat in Umtali aan die VMEO in hierdie verband gegee is bly dit volgens bestaande Wetgewing die verantwoordelikheid van die "voorsiener" om alle draadwerk te toets en goed te keur wat egter fisies onmoontlik geword het.

3. Die Wet word tans hoofsaaklik as bedinging deur die verteenwoordigers van die vakbonde op die Registrasieraad gebruik vir Nywerheidsraad ooreenkomste en word veiligheid wat die basiese doelstelling van die Wet is gerieflikheidshalwe oor die hoof gesien.

4. Die swak prestasie van leerling draadwerkers in die praktiese eksamens kan toegeskryf word aan die omvattende opleidingskedule wat vir die Elektrotegniese Aannemers bedryf voorgeskryf word en die onvermoë om daaraan te voldoen.

5. Daar behoort 'n laer vlak van registrasie vir draadwerkers te wees wie nooit die volle eksamens sal kan slaag nie maar wie nogtans produktief deur die nywerheid aangewend kan word en wie reeds as sulks gebruik word.

Meneer die President, moontlik kan die Voorsitter van die Registrasieraad gevra word om u verder in te lig wat hierdie aangeleentheid betref. Ek weet egter nie of hy bereid sal wees om hierdie saak vooruit te loop nie alvorens die Kommissie se bevindinge bekend gemaak is.

MNR. P. J. BOTES, President:

Die verslae is oop vir bespreking. Mnr. Weich wil u iets sê? Niks nie.

Here, kan ons dan die twee verslae aanvaar? Met dank aan mnr. von Ahlften vir al die werk wat hy doen in hierdie verband.

VERSLAG VAN DIE KOMITEE INSAKE TEGNIESE OPLEIDING VIR DIE TYDPERK 1977/79

1. Samestelling van VMEO se Komitee insake Opleiding.

Die volgende lede van die Vereniging is op 'n vergadering van die Uitvoerende Komitee wat gehou is op 27 Mei 1977, in bogenoemde Komitee aangestel:

D. H. Fraser ..... Durban
A. J. van den Berg ..... Krugersdorp
A. D. Dawson ..... Uitenhage
J. A. Loubser ..... Benoni
K. J. Murphy ..... Somerset West

In die tydperk waaroor verslag gedoen word, het bogenoemde komitee twee maal vergader ter oorweging van probleme wat deur die Vereniging ondervind word insake tegniese opleiding.

2. Hersiene Eksamenregulasies vir Bevoegdheidsertifikate uitgereik deur die Regering.

2.1 Die Hoof- Fabrieksinspekteur, mnr. A. A. Weich, het op 25 Mei 1977 'n aankondiging gedoen aan afgevaardigdes wat die VMEO kongres in Oos-Londen bygewoon het oor die nuwe regulasies wat ingestel staan te word met betrekking tot die eksamen wat afgelê word ter verwering van die bevoegdheidsertifikaat deur die Regering uitgereik. Hierdie sertifikaat word hierna die bevoegdheidsertifikaat genoem.

2.2 Die voorgestelde nuwe eksamen-regulasies is op 27 Mei 1977 oorweeg tydens 'n vergadering wat deur die VMEO se Uitvoerende Raad gehou is, en in die lig van die feit dat baie munisipaliteite die bevoegdheid-sertifikaat as 'n voldoende kwalifikasiestandaard beskou t.o.v. persone wat aan die hoof moet staan van elektrisiteitsopwekkings- en voorsieningsondernemings, was die Raad besorg oor die moontlikheid dat die voorgestelde veranderinge in die eksamenregulasies die vorige akademiese en praktiese standaarde kan verlaag.

2.3 Die Komitee insake Tegniese Opleiding is versoek om meer duidelikheid omtrent hierdie aangeleentheid te verkry en 'n vergadering is vervolgens belê met mnr. A. A. Weich, Hooffabrieksinspekteur van die Departement van Arbeid, mnr. T. M. Leff, president van die Instituut van Gediplomeerde Meganiese en Elektrotegniese Ingenieurs, asook verteenwoordigers van die VMEO. Mnr. Weich het op hierdie vergadering verdere inligting verskaf i.v.m. die hersiene eksamenregulasies, wat soos volg opgesom kan word:

2.3.1 Dit is reeds aanvaar dat die huidige eksamenstelsel betreffende die bevoegdheidsertifikate onbevredigend is en wel om die volgende redes, nl.:

(a) Leergange t.o.v. die verskillende vakke is nie duidelik uiteengesit nie en kandidate slaag hul eksamens bloot omdat hulle vooraf raai wat in die vraestelle gevra sal word en nie omdat hulle oor òf die kennis òf die akademiese standaard beskik nie.

(b) Studie kursusse vir die eksamens verskil heelwat van dié t.o.v. die Nasionale Tegniese Sertifikate, met die gevolg dat persone wat hul

REPORT OF THE TECHNICAL TRAINING COMMITTEE FOR THE PERIOD 1977/79

1. Composition of AMEU Training Committee.

The following members of the Association were appointed to this Committee by the Executive Council at its meeting held on 27th May, 1977:

D. H. Fraser ..... Durban
A. J. van den Berg ..... Krugersdorp
A. D. Dawson ..... Uitenhage
J. A. Loubser ..... Benoni
K. J. Murphy ..... Somerset West

Two meetings of the Committee have been held in the period under review in order to consider matters of concern to the Association in the sphere of technical training.

2. Revised Examination Procedure for Government Certificates of Competency.

2.1 On the 25th May, 1977, the Chief Inspector of Factories, Mr. A. A. Weich made an announcement to delegates attending the AMEU Convention in East London concerning the new examination procedures relating to the Government Certificate of Competency which it was proposed to introduce.

2.2 The proposed new examination procedure was considered by the AMEU Executive Council at its meeting held on the 27th May 1977, and as the Government Certificate of Competency is accepted by many Municipalities as a sufficient standard of qualification of persons to take charge of electricity generating and distributing undertakings, the Council was concerned that changes contemplated in the examination procedure should not result in a lowering of the previous academic and practical standards.

2.3 The Technical Training Committee was directed to obtain further clarification in this regard. A meeting was subsequently arranged between Mr. A. A. Weich, Chief Inspector of Factories — Department of Labour, Mr. T. M. Leff, President of the Institution of Certificated Mechanical and Electrical Engineers and representatives of the AMEU at which Mr. Weich provided further information regarding the revised examination procedures which may be summarised as follows:

2.3.1 It has been accepted that the existing examination systems for the Government Certificates of Competency are unsatisfactory from several points of view, e.g.:

(a) Subject syllabuses are vague and success in the examinations tends to be a matter of luck in "spotting" questions rather than a test of knowledge or academic standard.

(b) Courses of study for the examinations differ widely from the National Technical Certificate with the result that persons wishing

tegniese kwalifikasies op halfberoepsvlak wil verbeter, moet besluit of hulle vir òf die Bevoegdheidsertifikaat òf die Nasionale Sertifikate wil studeer.

(c) Indien die eksamens slegs gedeeltelik geslaag word, word geen erkenning daarvoor verleen nie en indien daar ingeskryf word vir die Nasionale Sertifikaat- of Diplomakursusse word geen vrystelling gegee op grond van die Regeringsertifikaat nie.

(d) Hierdie stelsel dien nie as aanmoediging t.o.v. verdere studies vir hoër kwalifikasies nie.

2.3.2 Daar word gemeen dat die nuwe regulasies, wat al dikwels gelei het tot samesprekings met en raadpleging van belanghebbende instansies soos die Instituut van Gediplomeerde Meganiese en Elektro-tegniese Ingenieurs, die S.A. Federasie van die Staal- en Ingenieursbedryf en EVKOM, van die nadele verbonde aan die huidige stelsel soos volg uit die weg sal ruim:

(a) Die geriewe wat aangebied word deur die Departement van Nasionale Opvoeding sal aangewens word vir die afneem van eksamens en sodanige eksamens sal op duidelik omskrewe leergange berus.

(b) Die studiekursus sal vrystelling verleen vir kursusse wat gedeeltelik geslaag word aangesien afsonderlike vakke wat alreeds geslaag is op verskeie vlakke vir Nasion

(c) Indien kandidate vakke in die Regeringsertifikaateksamen slaag, sal erkenning daarvoor verleen word t.o.v. hoër tegniese kwalifikasies en dit sal hopelik verdere studies aanmoedig.

2.3.3 Na verdere samesprekings i.v.m. die betrokke standaarde van die huidige sowel as die voorgestelde eksamenregulasies gesien vanuit die oogpunt van akademiese en praktiese bekwaamheid, het mnr. Weich sy standpunt beklemtoon, nl. dat die nuwe stelsel nie 'n laer kwalifikasiestandaard verteenwoordig nie. Hy het weer eens daarop gewys dat die hersiene stelsel t.o.v. die Regeringsertifikaateksamen 'n voldwonge feit is en dat die nuwe stelsel onmiddellik in werking sal tree, ofskoon daar gelyktydig met die huidige eksamenstelsel voortgegaan sal word vir 'n tydperk van vyf jaar ter wille van die persone wat reeds vir die ou kursus ingeskryf het.

2.4 Besonderhede oor die nuwe eksamenregulasies betreffende die bevoegdheidsertifikaat het verskyn in die VMEO se nuusbulletin van Junie 1977.

2.5 Die Departement van Nasionale Opvoeding het op 24 April 1978 'n nuwe eksamenregulasie (nr. 19 van 1978) waar afgekondig is dat die nuwe eksamenstelsel in werking sal tree met ingang van genoemde datum, asook dat die huidige eksamenstelsel geleidelik oor 'n tydperk van ongeveer vyf jaar uitgeskakel sal word, aan Kolleges vir Gevorderde Tegniese Onderwys uitgereik.

2.6 Dit dien hier gemeld te word dat mnr. V. R. Hamilton, hoof van die departement Meganiese Ingenieurswese aan die Natalse Kollege vir Gevorderde Tegniese Onderwys, op 14 September 1977 in 'n ope brief aan die president van die Instituut van Gediplomeerde Meganiese en Elektrotegniese Ingenieurs die twyfel geopper het i.v.m. die voorgestelde nuwe studiekursus vir die Regeringsertifikaateksamens. Hy het aanbeveel dat kursusse ingevoer word wat spesiaal beplan is om te voldoen aan die vereistes van gediplomeerde ingenieurs, nl. om hulle in staat te stel om masjinerie ingevolge die Fabriekswet te bedien; sodoende sal die kursus binne 'n korter tydperk voltooi kan word sonder dat die kwalifikasiestandaard enigsins daardeur verlaag word. Die Uitvoerende Komitee van die VMEO het op 'n vergadering wat op 11 November 1977 gehou is, besluit om by die Hoof-fabrieksinspekteur aan die hand te doen dat mnr. Hamilton se voorgestelde kursus in Installasie-ingenieurswese vir die Hoër Nasionale Sertifikaat dringend deur die verantwoordelike instansies bestudeer behoort te word sodat hierdie kursus òf die wat vermeld word in Bylaes A en B van die dokument wat deur die Hooffabrieksinspekteur opgestel is, sal vervang òf as alternatief sal dien. Daar word gewag op verdere verwikkelinge in hierdie verband.

3. Voorgestelde Wysiging van sowel die Wet op Professionele Ingenieurs (Wet nr. 81 van 1968) as die Regulasies.

Die Komitee insake Tegniese Opleiding is versoek om aandag te skenk aan hierdie aangeleentheid in sover dit op lede van die VMEO betrekking het. Onderstaande samevatting word ter inligting van lede verstrek.

3.1 Die Wet op Professionele Ingenieurs is tans alleenlik op ingenieurs in private praktyke van toepassing.

3.2 'n Wetsontwerp waarin voorsiening gemaak word vir wysigings van die Wet word tans bestudeer deur 'n gekose komitee wat deur die Regering aangestel is.

to improve their technical qualifications at a semi-professional level, have to choose between study for the Government Certificate of Competency or the National Certificates.

(c) No recognition is given for partial success in the examinations and possession of the Government Certificate does not constitute any form of exemption in National Certificates or Diploma courses.

(d) The system does not encourage continued study for higher qualifications.

2.3.2 The new procedure, which has been the subject of lengthy discussion and consultation with interested bodies such as the Institution of Certificated Mechanical and Electrical Engineers, Steel and Engineering Industries Federation of S.A. and ESCOM, is considered to overcome many of the disadvantages of the present system in that:

(a) The facilities of the Department of National Education will be utilised for the conduct of examinations which will be based on well defined syllabuses.

(b) The course of study will permit credit for partial success as passes in individual subjects will count towards National Technical Certificates at various levels.

(c) Success in subjects taken for the Government Certificate will constitute credits towards higher technical qualifications and hopefully encourage further study.

2.3.3 Following further discussion regarding the relative standards of the present and proposed examination procedures from the point of view of academic and practical competence, Mr. Weich reiterated his view that the new arrangements did not represent a lower standard of qualification. He stressed that the revised Government Certificate examination procedure was an accomplished fact and that the new system would be introduced immediately but the existing examination procedure will be continued in parallel with the new for a period of five years, for the benefit of those who have already embarked on the old course.

2.4 Details of the new Examination Procedures for the Government Certificate of Competency were published in the AMEU News Bulletin in June, 1977.

2.5 On the 24th April, 1978, the Department of National Education issued a new examination instruction No. 19 of 1978 to Colleges for Advanced Technical Education which had the effect of introducing the new examination procedures with effect from the date together with the phasing-out of the existing examination procedures over a period of about five years.

2.6 It is relevant to record that Mr. Hamilton, Head of the Department of Mechanical Engineering at the Natal College for Advanced Technical Education, in an open letter to the President of the Institution of Certificated Mechanical and Electrical Engineers dated 14th September, 1977, expressed reservations concerning the proposed new course of study for the Government Certificate examinations. He recommended the introduction of courses specifically structured to meet the academic requirement of Certificated Engineers to equip them to take charge of machinery in terms of the Factories Act, which would reduce the time taken for the course without reducing the standard of the qualification. At its meeting held on the 11th November, 1977, the AMEU Executive Committee resolved to suggest to the Chief Inspector of Factories, that Mr. Hamilton's proposed Higher National Certificate Course in Plant Engineering be studied by the responsible bodies as a matter of urgency with a view to the course being substituted or accepted as an alternative for those specified in Schedules A and B of the document released by the Chief Inspector of Factories. Further developments in this regard are awaited.

3. Proposed Amendments to Professional Engineers Act No. 81/1968 and Regulations.

The Technical Training Committee was directed to give attention to this matter in-so-far as it affects members of the AMEU. The following summary is presented for the information of members.

3.1 The Professional Engineers' Act is presently limited in its application to Engineers in private practice.

3.2 A Bill has been submitted to Parliament providing for amendments to the Act and is currently being examined by a Select Committee appointed by the Government.

3.3 Die hoofdoel van die wysigings van die Wet is om —

(a) die toepassing van die Wet dermate uit te brei dat dit ander persone benewens natuurlike persone sal insluit. Dit sal die huidige plaaslike owerhede raak na 'n tydperk van vyf jaar vanaf die datum waarop die wysigings in werking tree;

(b) daarvoor voorsiening te maak dat werkgewers belet word om opdragte aan professionele ingenieurs te gee waardeur hulle by die uitvoer daarvan die reëls van die Gedragskode sou oortree;

(c) raadgewende ingenieurs in private praktyke te beskerm teen onbillike mededinging deur instan-sies wat raadgewende dienste teen laer tariewe aanbied weens die feit dat hulle nie deur die huidige wetsbepalinge gebind is nie; en

(d) voorsiening te maak dat beheer uitgeoefen word oor aanverwante ingenieursbedrywighede wat onderneem word deur persone in besit van kwalifikasies wat nie t.o.v. registrasie as professionele ingenieurs erken sal word nie, soos byvoorbeeld wetenskaplikes en tegnici.

3.4 Die Federasie van Verenigings van Professionele Ingenieurs (F.V.P.I.) het dokumente betreffende die voorgestelde wysigings, asook 'n uitnodiging om op 7 Maart 1978 'n vergadering van die Federasie by te woon, aan die President van die VMEO gestuur.

3.5 Op 'n vergadering van die VMEO se Komitee insake Tegniese Opleiding gehou op 15 Februarie 1978, het die president en registrateur van die Suid-Afrikaanse Raad vir Professionele Ingenieurs (S.A.R.P.I.) waardevolle verduidelikings en addisionele inligting insake die voorgestelde wysigings verskaf.

3.6 Die president van die VMEO het die vergadering van die F.V.P.I. op 7 Maart 1978 bygewoon en by hierdie geleentheid die standpunte wat deur die VMEO gehuldig word, aan die voorgelê. Die VMEO is ver-volgens daarvan in kennis gestel dat hulle hul voorleggings regstreeks aan die Gekose Komitee kan maak.

3.7 Die president van die VMEO het op 28 Maart 1978 'n memorandum aan die Gekose Komitee voorgelê.

3.8 Die S.A.R.P.I. het 'n memorandum aan die Gekose Komitee voorgelê waarin 'n hele paar aangeleenthede wat deur die Opleidingskomitee tydens hul samesprekings met die president en registrateur op 15 Februarie 1978 te berde gebring is, in aanmerking geneem word.

3.9 Lede van die VMEO is klaarblyklik besorg oor hierdie aangeleentheid, hoewel dit nie wil voorkom asof die voorgestelde wysigings die werksaamhede van munisipale elektrisiteitsondernemings sal benadeel nie, mits kennis geneem word van die vertoë wat tot die Gekose Komitee gerig is.

3.10 Wat paragraaf 4 betref van die president van die VMEO se memorandum aan die Gekose Komitee (Bylae 'A') wat verwys na die buitensporige haas waarmee die konsepwysigingswetgewing klaarblyklik opgestel is, het die registrateur van die Suid-Afrikaanse Raad vir Professionele Ingenieurs egter in 'n brief gedateer 27 April 1978 nadere inligting verskaf insake die stappe en onderhandelinge wat die opstel van die wysigings sedert 1975 voorafgegaan het. Hierdie inligting dui daarop dat dit, in teendeel, heelwat tyd en dinkwerk geverg het.

4. Natalse Tak van die Opleidingskema insake Leerlingelektrisiëns.

In die vorige verslag van die Komitee insake Tegniese Opleiding is melding gemaak van 'n skema wat sou dien as aanmoediging vir munisipaliteite om leerlinge op groot skaal te begin oplei sodat 'n behoorlike bekwaamheidstan-daard gehandhaaf kan word. Daar sou voorsiening gemaak word vir die betaling van heffingsgelde deur ander munisipaliteite wat ambagsman-elektrisiëns in diens neem, asook vir die betaling van subsidies aan munisipaliteite wat met die opleiding van leerlingelektrisiëns gemoeid is.

4.1 Mnr. M. P. P. Clarke, saamroeper van die onderkomitee wat saamgestel is uit lede van die Natalse Munisipale Vereniging, die Vereniging van Munisipale Elektrisiteitsondernemings (Natalse tak) en verteenwoordigers van die munisipaliteite van Durban en Pietermaritzburg, het op 27 September 1977 'n memorandum gedateer 23 Junie 1977 aan die Natalse Munisipale Vereniging voorgelê. Die voorstelle, wat beklemtoon hoe belangrik dit is om te verseker dat daar 'n toereikende getal behoorlik opgeleide elektrisiëns beskikbaar is om in die toekomstige personeelbehoeftes van munisipale elektrisiteitsondernemings te voorsien en dat elke instansie tot die koste daaraan verbonde, moet bydra, word breedvoerig in hierdie memorandum uiteengesit. Die verwagte finansiële implikasies t.o.v. die afsonderlike munisipaliteite in Natal word ook in die memorandum vermeld.

3.3 The main objectives of the amendments to the Act are —

(a) To extend the application of the Act to personae other than natural persons. This will affect existing local authorities after a period of five years from the effective date of the amendments;

(b) To provide that employers be prohibited from requiring Professional Engineers in their employ to contravene the Code of Conduct.

(c) To safe-guard Consulting Engineers in private practice from unfair competition from Companies offering consulting services at lower fees through not being bound by the existing provision of the Act, and

(d) To provide for the control of allied engineering activities undertaken by persons possessing qualifications not recognised for registration as a Professional Engineer, such as scientists and technicians.

3.4 Documents relating to the proposed amendments were forwarded to the President of the AMEU by the Federation of Societies of Professional Engineers (F.S.P.E.) together with an invitation to attend a meeting of the Federation on 7th March 1978 to discuss the proposals.

3.5 A meeting of the AMEU Technical Training Committee was held on the 15th February, 1978, at which the President and Registrar of the South African Council for Professional Engineers (S.A.C.P.E.) provided helpful explanations and additional information relating to the proposed amendments.

3.6 The President of the AMEU attended the F.S.P.E. Meeting on the 7th March 1978 and presented the AMEU's view point. The AMEU was subsequently advised that it could make submissions directly to the Select Committee.

3.7 The President of the AMEU submitted a memorandum to the Select Committee on the 28th March 1978.

3.8 A memorandum has also been submitted to the Select Committee by S.A.C.P.E. and a number of the points raised by the Training Committee in the discussion held with the President and Registrar on the 15th February, 1978, have been taken into account in their submission.

3.9 This matter is of obvious concern to members of the AMEU but it does not appear that the proposed amendments will prejudice the operations of municipal electricity undertakings provided cognizance is taken of the representations made to the Select Committee.

3.10 In regard to paragraph 4 of the AMEU President's memorandum to the Select Committee (Annexure 'A') referring to the apparent undue haste in the preparation of the Draft Amending Legislation, the Registrar of the South African Council for Professional Engineers, in a letter dated 27th April, 1978, provided additional information regarding the lengthy preliminary procedures and negotiations which had taken place since 1975 which indicated that a considerable amount of time and thought had been given to the drafting of the amendments.

4. Natal Branch Apprentice Electrician Training Scheme.

Reference was made in the previous report of the Technical Training Committee to a proposed scheme to encourage Municipalities to undertake the training of Apprentices in sufficient numbers and to adequate standards of proficiency, which provided for the payment of levies by all Municipalities employing Artisan Electricians and the payment of subsidies to those Municipalities engaged in the training of Apprentice Electricians.

4.1 A memorandum dated 23rd June 1977 was submitted by Mr. M. P. P. Clarke, Convenor of the Joint Sub-Committee comprising members of the Natal Municipal Association, the Association of Municipal Electricity Supply Undertakings (Natal Branch) and representatives of Durban and Pietermaritzburg Municipalities, to the Natal Municipal Association for consideration on 27 September 1977. This memorandum fully outlined the proposals indicating the importance of ensuring that adequately trained Electricians were available in sufficient numbers to meet the future requirements of municipal electricity undertakings and to ensure that the associated financial burdens were fairly shared. The memorandum also indicated the anticipated financial effect on individual Municipalities in Natal.

4.2 Die memorandum het ongelukkig nie byval gevind by die Natalse Munisipale Vereniging nie en die Natalse tak van die VMEO het op 'n vergadering gehou op 23 Februarie 1978 besluit dat die aangeleentheid tydelik agterweë gelaat moet word. Daar is gemeen dat die huidige ekonomiese toestand sal verhoed dat die skema ingestel word en wel om twee redes, nl. die feit dat daar deesdae 'n wakende oog oor munisipale uitgawes gehou word en dat daar nou meer ambagsmanelektrisiëns beskikbaar is as gevolg van die agteruitgang wat die land se boubedryf tans ondervind.

5. Die Gesamentlike Munisipale Opleidingsentrum aan die Oos-Rand.

5.1 In die verslag van die Komitee insake Tegniese Opleiding wat aan die VMEO-kongres van 1977 voorgelê is, is daar melding gemaak van die sentrum vir basiese opleiding wat gestig staan te word in 'n biblioteekgebou in Benoni wat omskep is om in die behoeftes van leerlingelektrisiëns en -motorwerktuigkundiges te voorsien.

5.2 Die sentrum kon nie in Januarie 1978 geopen word soos wat daar verwag is nie, maar die Benoni-munisipaliteit doen reeds die nodige stappe t.o.v. die werwing van die twee instrukteurs wat daar benodig word en mnr. Loubser meen dat die sentrum in Januarie 1979 in volle gang sal wees.

5.3 Koste sal gedeel word deur die betrokke munisipaliteite in verhouding tot die salaris van elke afsonderlike stadsklerk.

5.4 Ofskoon die personeel van die sentrum uit werknemers van die Benoni-munisipaliteit sal bestaan, sal die projek onder die bestuur wees van 'n komitee wat uit ingenieurs van die betrokke stede saamgestel sal wees.

5.5 Die munisipaliteite wat in hierdie stadium by die onderneming betrokke is, is dié van Benoni, Boksburg, Brakpan, Edenvale, Germiston, Kempton Park en Springs. Ander nabygeleë munisipaliteite wat nie oor hul eie opleidingsentrums beskik nie, sal heelwaarskynlik ook in die toekoms by hierdie skema aansluit.

5.6 Die voorneme is om jaarliks vier kursusse wat elk oor drie maande sal strek, aan te bied en ongeveer 20 leerlinge sal vir elke kursus kan inskryf.

6. Opleiding van Professionele Ingenieurs.

Dit was verblydend om te verneem dat die Suid-Afrikaanse Raad vir Professionele Ingenieurs Port Elizabeth se opleidingsprogram t.o.v. gegradueerde ingenieurs goedgekeur het en dat hierdie stad nou die tweede naas Johannesburg is om sodanige goedkeuring te verkry.

4.2 The memorandum unfortunately failed to gain support by the Natal Municipal Association and the Natal Branch of the AMEU at its meeting held on 23rd February 1978 resolved that the matter be held in abeyance for the time being. It was considered that the economic conditions prevailing at the time militate against the introduction of the scheme in two respects viz., the close surveillance being maintained on Municipal expenditure and the improved availability of Artisan Electricians due to the depressed state of the Building Industry in the Country.

5. East Rand Joint Municipal Training Centre.

5.1 Reference was made in the report of the Technical Training Committee to the 1977 AMEU Convention of the joint basic training centre to be established in a converted library building in Benoni to cater for Electrician & Motor Mechanic Apprentices.

5.2 It was not possible to open the centre in January 1978 as previously envisaged but steps are currently being taken by the Benoni Municipality to recruit the two instructors required and Mr. Loubser expects to commence operation in January 1979.

5.3 Costs will be shared by participating Municipalities pro-rata to the salaries of their Town Clerks.

5.4 While the staff of the centre will be employees of the Benoni Municipality, the direction of the establishment will be in the hands of a committee formed from Engineers of the participating towns.

5.5 The Municipalities involved at this stage are Benoni, Boksburg, Brakpan, Edenvale, Germiston, Kempton Park, and Springs. It is probable that other nearby Municipalities which do not have their own training establishments will join the scheme in the future.

5.6 It is proposed to cater for about twenty apprentices at a time in four courses of three months duration per year.

6. Training of Professional Engineers.

It is pleasing to record that Port Elizabeth have had approval of their training programme for Graduate Engineers by the South African Council for Professional Engineers and join Johannesburg as the second Municipality to have such approval.

D. H. FRASER
SAAMROEPER/CONVENOR

MR. D. H. FRASER, President Elect:

Mr. President, the report submitted by the Technical Training Committee is fairly comprehensive, perhaps I could just run briefly over the various matters that have been dealt with in the last two years.

Firstly, you will remember that at the last Convention Mr. Weich made an announcement concerning revised examination procedures for the Government Certificate of Competency exams, and this matter was referred to the Executive Council who were concerned that the changes made should not lower the standards because of the use made of the Government Certificate by a lot of municipalities in setting a standard for qualification of engineers. As a result of discussions which took place with the Chief Inspector of Factories and the President of the Institution of Certificated and Mechanical Engineers, the Training Committee and the Executive Council subsequently were satisfied that the proposals did not in fact represent a lowering of standard for the Government Certificate and in any event there was nothing that could be done about it, because this was already an accomplished fact, and the position now is that there is a phasing out of the old system of examination and a phasing in of the new examinations which are set by the colleges for advanced technical education and follow closely the diploma and national certificate courses.

There was a suggestion by the Head of the Department of Mechanical Engineering of one of the Advanced Technical Colleges that the course based on the standards of the Diploma and Technical Certificate level should be more specifically structured in the content of its syllabus towards the requirement of an engineer required to take charge of machinery in terms of the Factories Act.

The Executive Council considered this and recommended that the authorities give consideration to this proposal but to date we have not been informed of any developments in that regard. I don't know if Mr. Weich is still here and whether he could perhaps comment.

Then the question of proposed amendments to the Professional Engineers Act came before the Committee. It is probably common knowledge that a bill was submitted to Parliament in draft form with intention of extending the scope of influence of the Professional Engineer's Act to persons other than natural persons, and this proposal would have an effect on existing local authorities. The proposal is that there be a five-year phasing-in period of new requirements. Another objective of the amendments to the Act was to prohibit employers from requiring Professional Engineers to contravene the code of conduct and thirdly, to safeguard consulting engineers from unfair competition from companies which did not fall under the existing provisions of the Act and then, lastly, to provide for the control of allied engineer activities such as scientists and technicians.

The bill was referred to a Select Committee and the AMEU submitted a memorandum to the Select Committee on 28th March and a copy of the memorandum is included in the papers which were contained in your folders and referred to as Annexure A.

At this time the matter is still under consideration by the Select Committee. I have no further information but if anybody in the audience has, it might be of interest to the members.

Reference was made previously to a Natal Branch apprentice training scheme which in concept envisaged levies being paid by all municipalities in proportion to the number of artisans employed with the object of establishing a fund to compensate authorities who provided training for electricians by taking on apprentices.

A memorandum was submitted to the Natal Municipal Association and

unfortunately in the present economic climate failed to gain support, and the Natal Branch have decided that in the meantime the scheme should be held in abeyance.

Regarding the East Rand Joint Municipal Training Centre, I think Mr. Loubser might be able to give us the latest position there. It was not possible to open the centre in January 1978, as was previously anticipated at the time of preparation of the report and endeavours were being made to recruit instructors to commence operation in January 1979.

The last matter contained in the report was on the subject of Training Programme for Professional Engineers. Port Elizabeth now has an approved training programme and they together with Johannesburg, to the best of my knowledge, are the only two municipalities who have yet had a training programme approved by the Council for Professional Engineers.
One matter that is presently being examined by the Technical Training Committee is a submission by the Highveld Branch concerning the shortage of Electrical Engineers in Municipalities and a meeting has been held at which certain ideas were put forward. It was decided that in the first instance some factual information should be obtained to establish the extent of the shortage, the reasons therefor and ways in which the shortage may be overcome. A questionnaire will shortly be circulated to all Member Undertakings and I would request through you Mr. President that Municipalities give careful attention to this, because it is a matter of great importance to all municipalities that we really perfectly complete this questionnaire and submit any information which members feel may be helpful to the Training Committee in compiling some sort of report or memorandum which may assist in alleviating the present difficult situation as far as shortage of suitably qualified staff is concerned.

A suggestion has already been put forward in fairly tangible terms that the establishment of bursaries and assistance to university students and students in other fields of study be provided and this may well be a positive step in the right direction because, obviously, there is a need to add to the pool of trained staff and it is the task, I think, of all employing agencies to assist in this regard.

Thank you Mr. President.

MR. P. J. BOTES, President:

Thank you Mr. Fraser. Gentlemen, may I urge you to please complete any questionnaires which you have received or may receive in this regard. This is very important and an excellent way whereby we can assist.

MR. E. de C. PRETORIUS, Potchefstroom:

Meneer die President, wat ek wil sê, na aanleiding van wat mnr. Fraser genoem het oor die tekort aan ingenieurs, verwys ek na 'n ontstellende berig wat in gister se Transvaler verskyn het: Ek lees dit —

VERSLAG VAN DIE EVKOM SUB-KOMITEE VIR 1977/78

1. ONDERSOEK IN DIE TARIEFBELEID EN TARIEFSTRUKTUUR AANGAANDE DIE VOORSIENING VAN ELEKTRISITEIT IN SUID-AFRIKA.

In die Staatskoerantkennisgewing No. 5466 van 25 Maart 1977, het die Minister van Ekonomiese Sake die Raad van Handel en Industrieë opdrag gegee om bovermelde saak te ondersoek en daaroor verslag te doen.

Na beraad met die verskillende Takke, het die Evkom Subkomitee 'n verslag op 9 Mei 1977 ingedien en het verder 'n vraelys in die verband voltooi op 12 Julie 1977, behalwe vir spesifieke vrae aangaande die beleid van individuele munisipaliteite. Die uitslag van hierdie ondersoek word nog afgewag.

2. OORMAAT AANVRAAGHEFFINGS.

Evkom is nie in staat om uitstaande tarief en voorsieningsaangeleenthede te bespreek voordat die Raad van Handel en Industrieë hulle bevindings gepubliseer het nie. Geen vordering is derhalwe gemaak in verband met heffings vir oormat aanvraag wat voortspruit uit onderbreking van Evkom voorsiening nie.

3. VERHOGING VAN EVKOM TARIEWE.

Mnr. Barnard het die VMEO verteenwoordig op 'n vergadering van alle verbruikers, waar die voorgestelde verhogings ter tafel gelê is. Hierdie verhogings is later aan in die staatskoerant gepubliseer en word as redelik beskou, in besonder van wat die Natalse en

"Suid-Afrika het verlede jaar 'n netto verlies van 907 persone met professionele kwalifikasies aan migrasie verloor, volgens statistiek wat deur Min. Hennie Smit vrygestel is.

Mnr. Smit het op 'n skriftelike vraag gesê Suid-Afrika het verlede jaar 3 032 persone met sodanige kwalifikasies ontvang en 2 125 aan die buiteland verloor. Die grootste getal onder die emigrante was elektriese ingenieurs (347) en geneeshere (205), terwyl die ontvangste die grootste was onder verpleegsters (216) en elektriese ingenieurs (135). Altesaam 76 geneeshere het na Suid-Afrika geïmmigreer."

en die snaaksste van alles, die opskrif van die berig is: "Suid-Afrika verloor 205 dokters verlede jaar".

MNR. J. A. LOUBSER, Benoni:

Meneer die President, na aanleiding van wat mnr. Fraser gesê het in verband met die Oos-Randse Opleidingsentrum. Ons het wel een aanstelling gemaak, die Elektrotegniese Instrukteur. Daar word tans die betrekking van Meganiese Instrukteur geadverteer, ons hoop om dit ook eersdaags te vul.

Ek het egter 'n klein moeilikheidjie opgetel, en dit is dat 'n mens nou nie meer as een vakleerling mag oplei deur middel van een ambagsman nie. Ek moes dus by die Departement van Arbeid aansoek doen vir vrystelling. Hulle het vir ons gesê dat hulle ons vrystelling sal gee op die voorwaarde dat ons hele opleidingsentrum aan sekere vereistes voldoen.

Nou, waar ek op hierdie stadium al wou besig wees met die opleiding van vakleerlinge moet ek nou eers die sentrum geheel en al voltooi sodat hulle dit kan kom goedkeur.

Ek wil ook sê, dat die reaksie wat ons van ons geaffilieerdes verkry het wonderlik was. Ek kan vir u sê dat van ons groot vervaardigers wat hier teenwoordig is vir ons sekere apparaat belowe het, en daar is ander wat alreeds afgelewer het. Daar is ook van die motornywerheid firmas/groot vervaardigers wat vir ons toerusting belowe het, wat ons in die opleidingsentrum kan gebruik.
So, op hierdie stadium kan ek sê dat dit lyk of dit goed gaan en of ons die skema eersdaags in werking sal hê.

Dankie meneer die President.

MNR. P. J. BOTES, President:

Ons wil mnr. Loubser bedank vir wat hulle daar aan die Oosrand doen om vakleerlinge op te lei.

Ek kan dit net noem dat ek ook in Roodepoort so 'n sentrum het waar vakleerlinge opgelei word, en heelwat sukses word behaal. Ons het 'n paar vakatures daar, die vakleerlingskool is nie vol nie en as daar van die Wesrandse dorpe is wat miskien vakleerlinge daar praktiese opleiding wil laat doen, is hulle welkom.

REPORT OF THE ESCOM SUB-COMMITTEE FOR 1977/78

1. INVESTIGATION INTO THE TARIFF POLICY AND TARIFF STRUCTURE IN RESPECT OF THE SUPPLY OF ELECTRICITY IN SOUTH AFRICA.

In Government Gazette Notice No. 5466 dated 25 March 1977, the Minister of Economic Affairs directed the Board of Trade and Industries to investigate and report on the above matter.

After consultation with the various Branches, the Escom Subcommittee submitted a memorandum on 9 May 1977 and further completed a questionnaire, apart from specific questions relating to the policy of individual municipalities, in this regard on 12 July 1977. The outcome of this investigation is still awaited.

2. EXCESS DEMAND CHARGES.

Escom are unable to discuss outstanding tariff and supply matters until the Board of Trade and Industries have published their findings. No progress has therefore been made on the question of charges for excess demand resulting from failure of Escom supply.

3. INCREASE IN ESCOM TARIFFS.

Mr. Barnard represented the AMEU at a meeting of all consumers at which the increases proposed were tabled. These increases have subsequently been gazetted and are considered reasonable, particularly in the case of the Natal and Cape Northern Undertakings.

Noord-Kaaplandse Ondernemings betref. Evkom verwag verder 'n gemiddelde verhoging in die energieheffingstarief van 4,3% gedurende 1979, ooreenkomstig met die verwagte toename in steenkoolpryse. Hersamestelling van Evkom se tariewe sal gedurende 1979 voltooi word, maar hierdie hersamestelling sal nie verbind wees met verhoogde verkoopsinkomste nie.

4. VOORSIENING AAN GEBIEDE BUITE DIE MUNISIPALE GEBIEDE.

Die VMEO het 'n brief van die Sekretaris vir Industrieë ontvang, gedateer 25 Oktober 1978, oor "Riglyne in verband met Elektrisiteitsvoorsiening Buite die Regsgebiede van Stedelike Plaaslike Besture".

'n Afskrif van die antwoord wat gestuur is, is aan alle Takke gestuur.

Escom further expect an average increase in the energy charge rate of 4,3% during 1979, corresponding to expected increase in coal prices. Restructuring of Escom's tariffs will be implemented during 1979, but this restructuring will not be associated with increased sales revenue.

4. SUPPLY TO AREAS OUTSIDE MUNICIPAL AREAS.

The AMEU received a letter dated 25 October 1978 from the Secretary for Industries on "Guide-lines with regard to the Supply of Electricity outside the Jurisdiction of Urban Local Governments".

A copy of the reply sent has been forwarded to all Branches.

W. BARNARD
SAAMROEPER/CONVENOR

MR. W. BARNARD, Johannesburg:

Mr. President, ladies and gentlemen, I was a bit concerned at the misgivings that some people had this morning when they heard the discussion on Escom's tariffs and I think a lot of people are not aware of what the relationship is between the AMEU and ESCOM. In fact we have accepted over the years that we have a love-hate relationship and on this basis we have one year that we love them and one year that we hate them. We were not quite sure what sort of year it was going to be this year until Mr. Palser arrived at the microphone but now we know. In fact, the Liaison Committee has had a very tough time the last year or so, but I would say that ESCOM has had probably a more tough time and this really results from investigation into tariff policy and tariff structure.

We have had any number of questionnaires to complete which we have done to the best of our ability. In fact, the ESCOM Liaison Committee has done it on behalf of the AMEU, except for certain specific financial matters which we had to refer to each local authority to deal with itself.

As I have stated in our report, there are still certain outstanding matters that are of concern to local authorities, particularly the matter of being charged for excess demand after interruption of supply. These are matters that we cannot discuss at this stage until we can see the outcome of this investigation.

Finally, I am probably sticking my neck out a bit here, but I was invited to represent the AMEU at a meeting with ESCOM to discuss their proposed increased tariffs for this year, which we now all know about and I did find a lot of people, particularly amongst the opposite sex, who waxed fairly eloquently on these increases and the terrible fate that was in store for us. I personally felt that for the first time in quite a number of years, we have been extremely reasonably dealt with by ESCOM. I do not think that anybody can expect a tariff to go up by less than an average of 4,3% over a year and that is, it is hoped, the increase that we will be having this year.

The other outstanding matter in the ESCOM tariff which is also of extreme interest and concern to us is the restructuring of their tariff and I believe that ESCOM is now rapidly reaching the point where they will be implementing their restructuring which, as my report says, is not with the object of getting in additional income but to get correct balance between their demand and energy related costs.

I think this very strongly supports our contention that we have to look very carefully at the control of our demand.
Thank you.

MR. D. C. PALSER, Cape Town:

Mr. President, in my contribution to the joint paper of Mr. Barnard and Mr. Marloth on Load Management, I expressed the view that Escom's standard two-part maximum demand tariff is today no longer suited to the needs of the larger municipalities and that what is required is a greater degree of sophistication in Escom's tariffs. For instance, this could possibly be achieved through multiple demand and unit rates to reflect more accurately and equitably the time incidence of costs.

Similarly, is it not high time that Escom gave consideration to offering a low off-peak rate to municipalities to encourage a shift in consumption from expensive on-peak periods to relatively cheap off-peak periods? Municipalities would then be able to pass on to their consumers these lower costs via time-of-day rates, possibly employing ripple control for tariff meter switching. I appreciate that Escom's national load factor is high and that it will also shortly be commissioning a pumped storage installation which will further increase its load factor. But nevertheless, I would submit that there should still be scope for offering, possibly on a limited scale, a relatively low off-peak rate.

Through you Mr. President, I would, therefore, like to ask Mr. Barnard whether these matters have been considered by the Escom Sub-Committee. If not, Mr. President, could due consideration be given to these matters by the Executive Council?

MR. P. J. BOTES, President:
Thank you mr. Palser. Mr. Marnard do you want to reply?

Mr. Barnard: No thank you Mr. President.

Then it will be referred to the Executive Committee. Does Escom want to contribute to this paper? No. Good, thank you very much.

Here, kan ons hierdie verslag aanvaar? Baie dankie.

VERSLAG VAN DIE AANBEVELINGS-KOMITEE VIR NUWE ELEKTRIESE TOEBEHORE 1977—1978

1. VERTEENWOORDIGING.

Die Komitee bestaan uit die volgende persone:

Mnre./Messrs. P. J. Botes
J. A. Loubser
L. B. Cumming
E. J. Chapple
F. J. Prins
B. C. Lawrence
J. V. Grant
J. T. Williams
J. A. Morrison
D. J. J. Conradie
D. F. Kneale
D. P. Viljoen

F. C. Harris

REPORT OF THE RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES 1977—1978

1. REPRESENTATION.

The Committee consists of the following persons:

— Sameroeper (VMEO)/Convenor (AMEU)
— VMEO/AMEU
— SAIEI/SAIEE
— EVKOM/ESCOM
— SABS
— SABS
— SABS
— SAIEI/SAIEE
— EIAN/EEAIA
— SAVRI/SAACE
— EKV(SA)/ECA(SA)
— Johannesburg Elektrisiteitsdepartement/ Johannesburg Electricity Department
— HPK/GPO

2. WERKING

Die VMEO behartig die administrasie van die komitee en dit behels heelwat korrespondensie. Die SABS lewer 'n hoogsgewaardeerde bydrae deur die toetsing van die toebehore en dra by tot die besluite wat geneem word. So ook verskaf Johannesburg Elektrisiteitsdepartement die byeenkomplek en huisves alle toebehore wat voorgelê word vir oorweging. Namens die komitee doen die verteenwoordigers van Johannesburg sekere inspeksies op verbeterde toerusting in oorlegpleging met die vervaardigers.

2. FUNCTIONING

The AMEU handles the administration of the committee which is involved in a substantial amount of correspondence. The SABS renders a highly valued contribution in the testing of the commodities and also contributes to the resolutions taken. Johannesburg Electricity Department provides the meeting place and accommodates all commodities submitted for consideration. On behalf of the Committee the members of Johannesburg carry out certain inspections on improved equipment and consult with the manufacturers.

Datum Date	Aantal goedgekeur Number approved	Aantal terugverwys Number deferred	Aantal nie goedgekeur Number not approved
1977-02-10	5	3	0
1977-05-12	4	4	2
1977-07-07	1	0	0
1977-08-25	3	5	1
1977-11-10	3	6	1
1978-02-16	9	3	1
1978-03-23	3	1	0
1978-05-25	1	3	1
1978-08-17	6	2	1
1978-11-02	2	3	2
TOTAAL/TOTAL	37	30	9

3. BEDRADINGSTELSELS

Gedurende 'n spesiale vergadering wat gehou is op 23 Maart 1978, is verskeie nuwe bedradingstelsels goedgekeur vir die beoogde proefinstallasies in Lenasia. Sedertdien is sekere van hierdie bedradingstelsels geïnstalleer.

3. WIRING SYSTEMS

At a special meeting held on 23 March 1978, several new wiring systems were approved to be used on the trial installations at Lenasia. Several of these wiring systems have since been installed.

4. VOORTBESTAAN VAN DIE AANBEVELINGSKOMITEE VIR NUWE ELEKTRIESE TOEBEHORE.

Die hoofkomitee van die SABS belas met die opstel van die bedradingskode het besluit dat hierdie komitee ontbind sodra die bedradingskode deur die Raad van die SABS goedgekeur is. Daar is egter nog nie besluit wanneer die werksaamhede van hierdie komitee aan die Buro oorgedra sal word nie.

4. CONTINUED EXISTANCE OF THE RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES

The main committee of the SABS currently engaged in compiling the wiring code has decided to disband the committee as soon as the wiring code is approved by the Council of the SABS. No decision has, however, been taken on when the duties of this committee shall be taken over by the Bureau.

5. TEN SLOTTE.

Ek kan getuig van goeie samewerking van komiteelede as-ook hulle gulhartige ondersteuning oor die afgelope twee jaar.

5. CONCLUSION

The whole-hearted co-operation of the committee members as well as their cordial support has been a feature of the working of this committee over the past 2 years.

P. J. BOTES
SAMEROEPER/CONVENOR

MR. J. A. LOUBSER, Benoni:

Mnr. die President, indien u die afgelope twee jaar se statistieke vergelyk met die van vorige jare dan word daar gemerk dat nie minder as 30 items terugverwys is na die vervaardigers nie en slegs 8 items gedurende die vorige tydperk. Onwillekeurig wonder 'n mens wat die oorsaak daarvan is en of dit nie moontlik is om die dubbele werk wat as gevolg daarvan ontstaan, te verminder nie. Is dit dalk omdat die vervaardigers van sodanige toerusting nie die korrekte prosedure volg deur bv. eers die toerusting aan die S.A.B.S. voor te lê vir toetsing ten einde te verseker dat dit aan die nodige toepaslike spesifikasies voldoen nie? Of is dit dalk omdat die vervaardigers meer kanse vat? Of word die toerusting dalk aan die aanbevelingskomitee voorgelê omdat hulle voel ons sal sagter met hulle te werk gaan as wat die S.A.B.S. sal doen?

Meneer die President, ons het in die jongste tyd met 'n nuwe gogga te doen. By die laaste Hoëveldtak vergadering is daar gevra dat wanneer die komitee nie eenstemmigheid oor die aanvaarding al dan nie van 'n kommoditeit kan bereik nie, dit so aan die verskeie lede gerapporteer word. In dié geval verwys ek spesifiek na 'n mini-geyser wat onlangs goedgekeur is. Ek kan nou vir u sê dat hierdie mini-geyser eenparig goedgekeur is, maar dat die lading van die geiser effens hoër was as wat sekere van ons lede sal toelaat. Ongelukkig is hierdie feit nie onder die aandag van die lede gebring nie, maar tydens die bekragtiging van die notule van die betrokke vergadering is dit reggestel.

Die lede se aandag word weer daarop gevestig dat hierdie slegs 'n "Aanbevelingskomitee" is, m.a.w. die finale beslissing vir die toelating al dan nie van 'n sekere kommoditeit berus nog steeds by die betrokke verantwoordelike persoon.

In dié verband is dit nodig om die lede se aandag te vestig op paragraaf 4 van mnr. Botes se verslag. Die gedagte is uitgespreek dat Werkgroep 4 van die hoofkomitee vir die hersiening van die Bedradingsregulasies in die toekoms die pligte van die aanbevelingskomitee sal oorneem. Dit word egter betwyfel of lede dan nog die reg sal hê om sekere kommoditeite te aanvaar of weg te wys, wat ookal die geval mag wees.

MNR. JAN LOUBSER

Mr. President, at the latest meeting of the Recommendations Committee, the new wiring systems were discussed. However, because of the fact that Working Group 4 has not completed its work on this subject, no decision could be taken. It was then decided that Mr. von Ahlften, as a member of the touring group who studied these wiring systems, and myself should attend the meeting of Working Group 4 which was scheduled for the 15th of February, 1979. This was done and at this meeting all six methods as recommended by the Touring Group were individually considered. The finding of the Working Group was that none of these methods could be used without first changing the Code of Practice for the Wiring of Premises and several S.A.B.S. specifications or alternatively insisting on the products to be used in South Africa complying with the relevant specifications. The one exception is perhaps the multibore conduit (MBC) which is a rewirable system and could be used with conductors complying with S.A.B.S. 150. However, a recommendation will be made to the Main Committee in due course.

Mr. President much has been said about the amount of money that could be saved with these new wiring methods, and it is high time that some decision be taken to this effect. I muself am not certain who will have the final say in the matter, but may I request everybody concerned with the different committee to solve the matter as soon as possible. This also goes for the manufacturers who may have to "tool-up" for these new systems as soon as a decision has been taken.

Ten slotte, Meneer die President, gedurende die afgelope aantal jare was dit aan u opgedra om toe te sien dat die Aanbevelingskomitee behoorlik funksioneer en dit het u met onderskeiding gedoen. Aanvaar nou hiermee my eie asook al die ander lede van die komitee se dank vir 'n taak wel gedaan.

MNR. P. J. BOTES, President:

Dankie mnr. Loubser.

Mr. Loubser stated — "The finding of the Working Group was that none of these methods could be used without first changing the Code of Practice of the Wiring of Premises, and several S.A.B.S. Specifications, or alternatively, insisting on the products to be used in S.A. complying with the Relevant specifications."

This has created confusion amongst our Affiliates in as much as they thought that the Wiring Systems would not be approved. The facts are that Working Group 4 has sorted out all these problems and will give directions on the conditions under which the systems can be used.

The Recommendations Committee will then reconsider this, and I think they will approve the systems according to the recommendations of the Working Group 4.

Any further questions on this matter?

Thank you.

VERSLAG VAN DIE SUID-AFRIKAANSE NASIONALE KOMITEE VIR VERLIGTING

Hierdie verslag dek die SANKV se werksaamhede oor die twee jaar 1977 en 1978.

Die vier-en-twintigste kongres en algemene jaarvergadering van die SANKV is van 13 tot 15 April 1977 in Port Elizabeth gehou en die President, mnr. M. F. Dempster was die voorsitter. Die kongres is amptelik geopen deur Sy Edele, die Burgemeester van Port Elizabeth, Raadslid D. Rossouw.

In sy Presidentsrede het mnr. Dempster die punt gestel dat hoewel die verhouding van energie wat in die vervaardiging van verligting verbruik word van 3—5% van die totale energieverbruik verteenwoordig, dit nie die rol van die verligtingsnywerheid in die besparing van energie minder belangrik maak nie.

Talle uitstekende referate is tydens die Kongres gelewer, waarvan dié van meer belang vir munisipale owerhede was:

1. "Die lewensbelangrikheid van energiebewaring in Nywerheidsverligting" deur mnr. Rowden van Holophane, V.K.
2. "Die verhouding tussen beheertoerusting en energiebewaring" deur mnr. Stockton van W. J. Parry (Pty.) Ltd., V.K.
3. "Die benutting van moderne padverligting in die RSA" deur J. K. von Ahlften, Stadsraad, Springs.
4. "Beheerapparaat vir padverligting" deur mnr. B. M. Lester, Durban Corporation.

Die meerderheid van die lede het gestem dat toekomende Kongresse afsonderlik van die VMEO-konvensie gehou word en dat die tweede helfte van die jaar die beste tyd sou wees.

Daar is ook besluit om verligtingsfirmas aan te moedig om by Kongresse uit te stal en dat so 'n uitstalling by die 25ste SANKV-Kongres gehou sou word.

Vermaak is deur Siemens S.A. in die vorm van 'n braaiery voorsien, en die Kongres het 'n fabrieksbesoek gebring aan Elektriese Lampvervaardigers van Suid-Afrika gevolg deur 'n skemeronthaal.

Mnr. J. K. von Ahlften is aangestel as President vir 1977/78 met mnr. L. O. Foster as Senior Ondervoorsitter en mnr. C. J. Kok as Junior Ondervoorsitter.

Die 25ste en geskiedkundige kongres en algemene jaarvergadering van die SANKV is in die Burgersentrum, Springs, van 12 tot 14 September 1978 gehou en die President, mnr. J. K. von Ahlften, was voorsitter. Die kongres is amptelik geopen deur mnr. A. A. Middlecote, Adjunk-Algemene Direkteur van die SABS.

In sy Presidentsrede het die President na die uitdaging van moderne verligting verwys wat op bewonderenswaardige wyse deur die plaaslike verligtingsnywerheid in S.A. oorkom is — in dié mate dat die RSA wat dit betref, oor die afgelope 25 jaar feitlik selfstandig geword het. Interessante referate is by die kongres gelewer, soos:

1. " 'n Honderd jaar van Elektriese Verligting" deur mnr. C. J. Kok van die NFNL, WNNR.

REPORT ON THE SOUTH AFRICAN NATIONAL COMMITTEE ON ILLUMINATION

This report covers the activities of SANCI for the two year period 1977 and 1978.

The twenty-fourth congress and annual general meeting of SANCI was held in Port Elizabeth from 13 to 15 April 1977 and the President, Mr M. F. Dempster was in the Chair. The Congress was officially opened by His Worship the Mayor of Port Elizabeth, Councillor D. Rossouw.

In his Presidential Address Mr Dempster made the point that although the proportion of energy consumed in the production of lighting ranges from 3—5% of the total energy consumption this does not make the part played by the lighting industry in conserving energy less worthy.

Many excellent papers were read at the Congress, the more important ones of interest to municipal authorities being:

1. "The vital importance of energy conservation in Industrial Lighting" by Mr Rowden of Holophane, U.K.
2. "The relationship between control gear and conservation of energy" by Mr Stockton of W. J. Parry (Pty.) Ltd., U.K.
3. "The Utilisation of modern roadlighting in the R.S.A.," by J. K. von Ahlften, Town Council of Springs.
4. "Roadlighting Controls" by Mr B. M. Lester, Durban Corporation.

The majority of members voted in favour of holding future congresses apart from the AMEU Conventions and that the second half of the year would be the most suitable time.

It was also decided to encourage lighting firms to exhibit at congresses and this was to be done at the 25th Congress of SANCI during 1978.

Entertainment was provided by Siemens S.A. in the form of a braaivleis and the congress included a factory visit to Electric Lamp Manufacturers of South Africa followed by a cocktail party.

Mr J. K. von Ahlften was elected as President for 1977/78 with Mr L. O. Foster as Senior Vice President and Mr C. J. Kok as Junior Vice President.

The 25th and historic congress and annual general meeting of SANCI was held in the Civic Centre, Springs, from 12 to 14 September 1978 and the President, Mr J. K. von Ahlften was in the Chair. The congress was officially opened by Mr A. A. Middlecote, Deputy Director General of the SABS.

In his Presidential Address the President referred to the challenge of modern lighting which had been met admirably by the local lighting industry in S.A. to the extent that the RSA has virtually become self sufficient in this respect over the past 25 years.

Interesting papers were read at the congress, such as:

1. "A hundred years of Electric Lighting" by Mr C. J. Kok of the NPRI, CSIR.
2. "Floodlighting for Security and Outdoor Sport" by Mr Aldworth of Thorn Lighting, U.K.

2. "Spreiverligting vir Sekuriteit en Buitesport" deur mnr. Aldworth van Thorn Lighting, V.K.
3. "Verligting vir die verbetering van Lug-veiligheid" deur mnr. J. D. Weyers, Raadgewende Ingenieur.
4. " 'n Oorsig van Verligtingsopvoeding" deur mnr. J. J. Grundy, Phosware, Springs.

Die feit dat die VMB ingestem het dat die VMEO die erkende instituut op die gebied van verligting is en dat die SANKV nie onder die instellings is wat deur die VMEO, na wie se konferensies die afvaardiging van verteenwoordigers deur plaaslike owerhede geregverdig is, erken word nie, is op die algemene jaarvergadering bespreek.

Daar is besluit om 'n sub-komitee aan te stel wat bestaan uit twee VMEO- en twee SANKV uitvoerende komiteelede wat die wanvertolking met die VMB sal bespreek en dan weer aan die twee betrokke organisasies verslag sal doen.

Vermaak is deur die Stadsraad van Springs aangebied in die vorm van 'n buffetaandete en 'n besoek aan die fabriek van Pilkington Glass Works is gevolg deur 'n skemeronthaal.

Mnr. J. K. von Ahlften is tot president herkies vir 1978/1979, terwyl mnr. L. O. Foster die senior visepresident sal wees en mnr. C. J. Kok die junior visepresident.

'n Uitstekende uitstalling is ook gehou ter herdenking van 100 jaar van elektriese verligting.

3. "Light for the improvement of Air Safety" by Mr J. D. Weyers, Consulting Engineer.
4. "A review of Lighting Education" by Mr J. J. Grundy, Phosware, Springs.

The submission of the UME that the AMEU is the recognised institute in the lighting field and that SANCI is not amongst the institutions which are recognised by the UME to whose conferences the sending of delegates by local authorities is justified was discussed by the annual general meeting.

It was decided to set up a Sub-Committee consisting of two AMEU and two SANCI Executive Council Members to discuss this misinterpretation with the UME and to report back to the two organisations concerned.

Entertainment was provided by the Town Council of Springs in the form of a buffet supper and the Congress included a factory visit to Pilkington Glass Works followed by a cocktail party.

Mr. J. K. von Ahlften was re-elected President for 1978/79 with Mr. L. O. Foster as Senior Vice President and Mr. C. J. Kok as Junior Vice President.

An excellent exhibition was also held to mark 100 years of electric lighting on this occasion.

J. K. VON AHLFTEN
VERTEENWOORDIGER/REPRESENTATIVE

MR. J. K. VON AHLFTEN, Springs:

Mr. President, may I briefly refer to the submission of the UME and say that SANCI has never claimed official recognition as a municipal institute. SANCI is a National Committee affiliated to the International Lighting Commission (CIE) and must serve the interests of the Lighting Industry as a whole in the R.S.A.

It is therefore up to the individual Public Lighting Authorities to decide to take part in the activities of SANCI, this deriving the benefits arising therefrom and to attend SANCI conferences. The Public Lighting Authorities in the Transvaal with an income in excess of R3 m per annum already have the approval of the D.L.G. for this purpose.

After careful consideration, it was felt that an AMEU/SANCI Sub-Committee to discuss this matter with the UME would serve no useful purpose and that matters be left as they are. The UME was informed accordingly.

The second point I wish to refer to is the discussion on the application of the standards set out in CIE Document 12/2 for Road Lighting in the R.S.A. which took place at the Technical meeting in Somerset West.

It was the consensus of the meeting, supported by the SABS, that these CIE standards would not be economically viable in the R.S.A. and that a revision of the SABS Code for Public Lighting in accordance with these standards did not seem justified at this stage.

This has caused some concern amongst Public Lighting Engineers and Messrs. Yates and Grundy are presently overseas attending a CIE Symposium on this matter and will specifically try to determine to which extent the CIE 12/2 recommendations are in fact being applied in the National Specifications of the other member countries of the CIE.

Mr. President, I would seriously suggest that Mr. Yates, Chief Lighting Engineer of Johannesburg, be invited to submit a report on this matter to the next Technical Meeting of the AMEU. I think it is important that the application of our present Code as well as the implications of Document CIE 12/2 be thoroughly investigated as this concerns the AMEU very intimately as the representative of Public Lighting Authorities in this country.

Then finally, Mr. President, I take it that all the AMEU members of SANCI are quite happy with the new arrangement to hold the SANCI Conferences in the latter half of the year and not close to or directly after the AMEU Convention or Technical Meeting as in the past. Although this did have the advantage of curtailing travelling costs where

MR. JOHN GRUNDY, Affiliate:

the same venue could be chosen, it did mean longer absence from work for the delegates concerned.

This apparantly was the reason why the majority of SANCI members did vote in favour of holding conferences not directly before or after an AMEU Convention or Technical meeting. Thank you.

MR. P. J. BOTES, President:

Thank you Mr. von Ahlften, your recommendation will be referred to the Executive Council.

We have also received a contribution from Mr. John Grundy of Phosware, who tendered his apologies for absence.

The CIE Publication No. 12 is not itself a specification enforceable by law in ant country. It is a basic document which individual countries can use in preparing their own specifications. U.K. for example has an entirely different form of specification from that of the CIE proposals, although it produces substantially the same results. If South Africa finds its present specification too difficult to handle it will presumably not come into line with CIE for a long time.

However, all over the world there is a tendency to control products by increasingly elaborate specifications. Sometimes one may regret this, but it is a fact of life. No doubt some future day will see the trend reverse and simplicity may become fashionable, but for the moment this is not so.

Some of these complex specifications seem foolish. For example, the EEC has spent many years formulating requirements controlling the design and testing of road lighting columns. One of the most involved sections is concerned to ensure that columns will not bend unduly or collapse because of windage. This section of the specification will greatly increase the expense of columns in the U.K. for a variety of reasons, although it is almost impossible to find a case in which a column as at present supplied has suffered.

South Africa must, therefore, decide how far the CIE prescriptions are worth applying in its own circumstances. National standards have to be changed in the course of time with changing economic circumstances, public opinion, technical advances and so on.

As Mr Waddy so cogently remarked, in May 1978, the costs must fall on the municipalities — that is the community — as must all costs ultimately. It is up to the authorities and their technical advisors to decide whether the requirements which they call for will ultimately save more than they cost.

VERSLAG VAN DIE W.N.N.R. SE ADVIESKOMITEE INSAKE ELEKTRIESE INGENIEURSWESE

Die Advieskomitee het in November 1977 en November 1978 vergader om die Jaarverslae van die Nasionale Navorsinginstituut vir Elektriese Ingenieurswese vir die jare 1976/77 (Elek 128) en 1977/78 (Elek 158) te oorweeg en om die navorsingsprogram vir die daaropvolgende jare te bespreek.

Die werksaamhede van die Instituut behels werk wat op 'n kontrakbasis onderneem word, sowel as navorsingsprogramme wat die volgende insluit:

1. 'n Breë spektrum van aktiwiteite op die gebied van elektriese kragingenieurswese waar veral die studie van die uitwerking van weerlig en die beskerming van kragstelstels teen spanningstuwing aandag geniet.
2. Die ontwikkeling van halfgeleiertegnologie, asook die toepassing daarvan op die ontwerp en vervaardiging van mikrostroombane.
3. Die toepasing van syfertegnieke en rekenaartegnologie op prosesbeheer, stelselnabootsing en syferkommunikasie of seinprosesering en op die ontwerp en uitleg van stroombane.
4. Die verskaffing van hulpdienste soos die ontwerp en opbou van spesiale elektroniese toerusting, die instandhouding en kalibrering van toerusting, 'n inligtingsdiens oor elektroniese instrumente en die praktiese opleiding van elektronika tegnici.

Die Advieskomitee word bygestaan deur subkomitees vir elektriese kragingenieurswese en halfgeleiertegnologie.

'n Groot deel van die werk van die Afdeling Elektriese Kragingenieurswese word gedoen in samewerking met ander lede van die Hoogspanningskoördineringskomitee en daar word onder die hoof van daardie komitee verslag gedoen. Ander items van besondere belang sluit in:

1. WEERLIGNAVORSING

Internasionale erkenning van die werk van die Instituut is bevestig deur die gebruik van metings wat op kragstelsels plaaslik gedoen is as 'n bron van inligting en invoer in die werk van internasionale komitees van CIGRÉ en die IEC en deur die aanvraag na die RSA 10 weerligteller vir gebruik beide as 'n kalibrering instrument en vir direkte opnames.

Een van die ontladings wat by die mas vir weerlignavorsing in Pretoria geregistreer is, is noemenswaardig vanweë die maksimum stroomwaarde van —80 kA met 'n maksimum stygtempo van 180 kA per usek vir die tweede straal. Volgens oorsese data is die waarskynlikheid dat 'n stroomgolfvorm van hierdie kaliber voorkom, slegs 1%. Metings by hierdie mas en by ander terreine word nou aangevul met videobandopnames wat die waarneming van die ontwikkeling van die straal met 20 m/sek. tussenposes moontlik maak.

'n Tweede weerligregistreerstasie is in Durban by die Universiteit van Natal opgerig om die eienskappe van donderstorms in die kusgebied en die verskille tussen dié en donderstorms in die hoëveld te bepaal.

2. KRAGSTELSELSTEURINGS

Afgesien van die bestudering van die effek van weerlig op kragstelsels wat in samewerking met Evkom onderneem word, is 'n aansienlike aantal ontledings van kragstelselsteurings op 'n kontrakbasis onderneem. 'n Mobiele laboratorium is vir die doel ingerig en 'n rekenaarprogram vir die ontleding van elektromagnetiese stuwings in kragstelsels is van die Bonneville Power Administration in die VSA verkry.

3. ELEKTROMAGNETIESE VERSOENBAARHEID

Die Instituut het 'n groep gestig om ad hoc dienste op hierdie gebied te koördineer en om die werksgroepe van die Hoogspanningskoördineringskomitee aan te vul.

Raadgewing ten opsigte van weerligbeskerming en aarding van verskillende installasies asook normale steurings in rekenaarinstallasies en ander gevoelige elektroniese stelsels word aangebied. 'n Handleiding is opgestel en daar word verwag dat dit binnekort algemeen beskikbaar sal wees.

4. ELEKTRIESE VOERTUIE

Die Mercedes Benz minibus en die Volkswagen ligte vragmotor wat deur die GES (Gesellschaft für Elektrischen Strassenverkehr) in Duitsland verskaf is, het altesaam 17 000 km voltooi teen die einde van Junie 1978. Die werkverrigtingstoetse op dié en ander voertuie word deur 'n intensiewe teoretiese program ondersteun en daar word ook onderhandel om verbeterde batterye te verkry.

REPORT ON THE WORK OF THE C.S.I.R. ADVISORY COMMITTEE FOR ELECTRICAL ENGINEERING

The Advisory Committee met in November 1977 and November 1978 to consider the annual reports of the National Electrical Engineering Research Institute for the years 1976/77 (Elec. 128) and 1977/78 (Elec. 158) and to discuss the proposed research programme for the ensuing years.

The activities of the Institute consist of research programmes and work undertaken on a contract basis and include:

1. A broad spectrum of activities in the field of power electrical engineering where special attention is being paid to the study of the effects of lightning and the protection of systems against voltage surges.
2. Development of semi-conductor technology and its applications to the design and fabrication of microcircuits.
3. The application of digital techniques and computer technology to process control, systems simulation, digital communication or signal processing and to the design and layout of circuits.
4. The provision of services such as the design and construction of special electronic equipment, the maintenance and calibration of equipment, an information service on electronic instruments and the practical training of electronics technicians.

The Advisory Committee is assisted by subcommittees for power electrical engineering and solid state technology.

Much of the work of the Power Engineering Division is done in conjunction with other members of the High Voltage Co-ordinating Committee and is reported under that heading. Other items of special interest are:

1. LIGHTNING RESEARCH

International recognition of the work of the Institute has been enhanced by use of data obtained from measurements made on local power systems by international committees of CIGRÉ and by the adoption of the RSA 10 lightning flash counter for use both as a calibrating instrument and for measurements.

One of the lightning strikes recorded at the research mast in Pretoria was noteworthy for a crest value of —87 kA on the first stroke and a crest value of —80 kA with a rate of rise of 180 kA per usec on the second stroke. According to overseas data, the probability of observing a current waveform of this calibre is only 1%. Measurements made at this mast and other locations have been enhanced by the installation of video tape recorders which permit the development of the stroke to be observed at 20 m intervals.

A second lightning monitoring station has been established in Durban at the University of Natal, with a view to establishing the characteristics of coastal thunderstorms and the differences between these and highveld thunderstorms.

2. SYSTEM DISTURBANCES

Apart from investigations into lightning disturbances which are being undertaken in conjunction with Escom, a large number of investigations into power system surges are being undertaken on contract. A mobile laboratory has been built for this purpose and a powerful computer programme for the analysis of power systems has been obtained from the Bonneville Power Administration in the USA.

3. ELECTROMAGNETIC COMPATIBILITY

The Institute has established a group to co-ordinate ad hoc services in this field and complement the working groups of the High Voltage Co-ordinating Committee.

Consulting services are being provided for lightning protection and earthing as well as minimising the effects of interference on computer installations and sensitive electronic equipment. A lightning protection guide for electronic installations has been drawn up and it is expected that it will be generally available in the near future.

4. ELECTRIC VEHICLES

The Mercedes Benz minibus and the Volkswagen pick-up supplied by GES (Gesellschaft für Elektrischen Strassenverkehr) in Germany had completed 17 000 km in total at the end of June 1978. The performance tests on these and other vehicles are being supported by an intensive theoretical programme and the supply of improved batteries is being negotiated.

Die Afdeling Opleiding en Inligting van die Instituut is verantwoordelik vir die opleiding van elektronika tegnici en het 'n omvattende program van kursusse vir praktiese opleiding met volledige handleidings opgestel. Onlangse toevoegings sluit in mikroverwerkers en rekenaargesteunde programmatuur ontwerp. Kort kursusse is beskikbaar, op versoek, aan persone van buite die W.N.N.R.

The Training and Information Division of the Institute is responsible for training electronics technicians and has developed a comprehensive programme of practical courses supported by detailed notes. Recent additions include microprocessors and computer aided software design. Short courses are available, on request, to persons from outside the C.S.I.R.

W. BARNARD
VERTEENWOORDIGER/REPRESENTATIVE

MNR. J. D. N. VAN WYK, W.N.N.R.:

Meneer die President, voor ek by die verslag kom verleen my tog net twee opmerkings, die eerste is, ek is vreeslik dankbaar vir wie ook al die klanksisteem hier verander het, want u weet ek het so 'n bietjie gevoel soos die ou dronkie wat huistoe geloop het een aand met sy een voet in die sloot en die ander een op die sypaadjie en toe gedag het sy een been het skielik korter geword as gevolg van al sy sondes, en ek het gister al begin dink ek is heeltemal stokdoof omdat ek niemand kon hoor nie.

Die tweede opmerking is net, ek het vreeslik bekommerd geraak toe my goeie vriend, Eugene Pretorius, begin lees het aan daardie koerantberig, maar gelukkig het hy toe beklemtoon die mense wat uitloop is elektro-tegniese ingenieurs, nouja, 'n paar minder Stellenboschers in die land sal ons nie kwaad doen nie, solank dit net nie Elektriese Ingenieurs is nie.

Mnr. die President, eerstens net ons baie ernstige waardering vir die bydrae wat die VMEO verteenwoordigers maak, eerstens op die Adieskomitee vir Elektriese Ingenieurswese van my Instituut, en tweedens ook op die gebied van die Hoogspannings-koördinerende Komitee, die verslag wat later sal behandel word. Ek dink dit sal vir u snaaks wees maar ons kan baie tegniese probleme oplos, maar een van die moeilike probleme wat geen navorsings-organisasie nog geslaag het om op te los nie is om kommunikasie te kry met die man wat eintlik die resultate moet gebruik wat 'n mens in 'n navorsings-organisasie bestudeer, en ons waardeer dus hierdie noue skakeling, eerstens, om die verrigtinge te kan bywoon en tweedens die bydrae wat u verteenwoordigers maak.

Meneer die President, dan een ander opmerking, en dit is dat vir my is dit interessant om te hoor hoe in die referate en in die besprekings so dikwels navore gekom het die gebruik van half-geleiers in kragingenieurswese.

U weet dit was nie baie lank gelede nie, vier/vyf jaar, toe sou 'n kragingenieur nie met 'n tang geraak het aan 'n half-geleier nie. Hy wou niks daarvan weet nie. Die saak begin natuurlik 'n baie belangrike rol speel in die gebied ook, en ek is eintlik dankbaar aan mnr. Barnard dat hy in die verslag wat hy opgestel het verwys na die werk wat ons in ons Instituut op hierdie gebied doen, en ons is dan ook alreeds besig om in samewerking met enkele persone van Evkom te kyk na sekere dinge waar half-geleiers miskien meer op die plaaslike toepassing gebruik kan word.

Ons wil ook aan u 'n uitnodiging rig om waar u sulke probleme het ook maar met ons te skakel, ons kan u nie belowe dat ons sal kan help nie, maar ek dink darem ons kan nuttige gedagtes wissel.

Mr. President, there is just one thing I'd like to add. Mr. Barnard, in his report, did not refer at this stage to our joint programme on the evaluation of insulation in high-voltage motors. This is a project which involves the Rand Water Board, Escom, Chamber of Mines and Iscor, and the objective really is to be able to monitor the state of the insulation of these motors over a number of years, so as to be able to predict, by non-destructive methods of measuring the time when one should rewind a particular motor; but even if that objective is not reached, by just monitoring the state of the insulation as time goes on, one can be warned of a pending failure. I think this is a valuable contribution from our side, which broadens our base for scientific information, and we feel that the participants do gain some insight into the state of their motors.

In conclusion, Mr. President, if there are any difficult questions, my colleague Dr. R. Anderson is here and he would be most willing to answer them.

Thank you.

VERSLAG: 42STE ALGEMENE VERGADERING VAN DIE ELEKTROTEGNIESE KOMMISSIE — MOSKOU 1977. DEUR MNR. KEN G. ROBSON, PRESIDENT

INLEIDING

As President van die VMEO, het ek die voorreg gehad om, as 'n lid van die Suid-Afrikaanse afvaardiging, die 42ste algemene vergadering van die Internasionale Elektrotegniese Kommissie van 6 tot 18 Junie 1977 in Moskou by te woon.

Die vergadering is bygewoon deur 1 100 afgevaardigdes uit 36 lidlande wat aan internasionale standaardisering op die gebied van elektrotegniese ingenieurswese, elektronika en langafstandkommunikasies werk.

Ernstige probleme ten opsigte van die verkryging van visums na Moskou vir lede van die Suid-Afrikaanse, Israeliese en Suid-Koreaanse afvaardigings is voor die vergadering ondervind. Visums vir die Suid-Afrikaners is uiteindelik slegs sowat dertien dae voor die aanvangsdatum van die vergadering uitgereik.

Hulde word gebring aan die aansien en invloed van mnr. R. H. Ford, Standaarderaadgewer by die Suid-Afrikaanse Ambassade in Genève, daar die toekenning van die visums grootliks aan sy pogings te danke is.

Ek het al die vergaderings van Tegniese Komitee no. 64: Elektriese Installasies van Geboue, die Komitee van Aksie en die Raad van die IEK bygewoon, wat almal in Moskou se Kragnywerheidsinstituut gehou is.

Kort besonderhede van hierdie vergaderings word hieronder verstrek:

TEGNIESE KOMITEE NO. 64: ELEKTIRESE INSTALLASIES VAN GEBOUE

Die vergaderings van hierdie Tegniese Komitee, een van die grootste en

REPORT: 42ND GENERAL MEETING OF THE INTERNATIONAL ELECTROTECHNICAL COMMISSION — MOSCOW 1977. BY MR. KEN. G. ROBSON, PRESIDENT

INTRODUCTION

As President of the AMEU, I was privileged to attend, as a member of the South African delegation, the 42nd General Meeting of the International Electrotechnical Commission held in Moscow from 6 — 18 June 1977.

The meeting was attended by 1 100 delegates from 36 member countries that are working on international standardisation in the fields of electrical engineering, electronics and long distance communications.

Prior to the meeting serious problems were encountered in obtaining visas for Moscow for the members of the South African, Israeli and South Korean delegates. Visas for the South Africans were issued eventually only some thirteen days before the opening date of the meeting.

Tribute is paid to the standing and influence of Mr. R. H. Ford, Standards Councellor at the South African Embassy in Geneva, as it was largely due to his efforts that the visas were granted.

I attended all meetings of Technical Committee No. 64: Electrical Installations of Buildings, The Committee of Action and the Council of the IEC all of which were held in Moscow's Power Industry Institute.

Brief details of these meetings are given hereunder:

TECHNICAL COMMITTEE NO. 64: ELECTRICAL INSTALLATIONS OF BUILDINGS

The meetings of this Technical Committee, one of the largest and most

belangrikste komitees van die IEK, het onder voorsitterskap van die leier van die Suid-Afrikaanse afvaardiging, mnr. A. A. Middlecote, plaasgevind.

Onder die meer belangrike besprekingspunte op 'n lang sakelys was:

1. Beskerming teen oorstroom.
2. Beskermingsmaatreëls teen elektriese skok.
3. Beskermingsmaatreëls teen oorstroom.
4. Skakeltuig en beheeruitrusting (vir beskerming, afsondering en skakeling).

   Suid-Afrika het sy besondere belangstelling in hierdie onderwerp aangedui en 'n gedetailleerde kommentaar voorgelê. Daar is besluit dat die Suid-Afrikaanse Nasionale Komitee gevra moet word om in die lig van die ander voorgelegde kommentaar sy voorstel in heroorweging te neem en om enige verdere voorstelle aan die betrokke werkgroep te stuur vir die oorlegging van 'n nuwe konsep.
5. Stroomdravermoë van geleiers en verwante oorstroombeskerming.
6. Gevolge van stroom wat deur 'n liggaam vloei.
7. Spanningsgolwe.
8. Aanvraag en verskeidenheid.

   Hierdie punt het aansienlike bespreking uitgelok en die besprekings is toegespits op die kwessie van die aard van die aanvraagfaktor en die toepassing daarvan.

   Aangesien daar nie tot 'n ooreenkoms gekom kon word nie, is 'n ad hoc-werkgroep ingestel om die probleem te bestudeer en 'n skriftelike verslag is by die laaste sitting van die vergadering deur die ad hoc-werkgroep voorgelê. Hierdie verslag moes deur die betrokke werkgroep bestudeer word.
9. Aanvanklike inspeksie en toetsing.
10. Afsondering en skakeling.
11. Veiligheidsdienste en gereedheidsvoorrade.
12. Identifikasie van geleiers.
13. Bouterreininstallasies.
14. Kanalisering.

    Onder die meer interessante punte wat uit besprekings voortgespruit het, was dat die titel "Begradingstelsels" in plaas van "Kanalisering" aanvaar is en dat die uitdrukkings "Toelaatbare stroom" en "Ampasiteit" nie die uitdrukking "Stroomdravermoë" behoort te vervang nie.
15. Aarding en beveiligingsgeleiers.
16. Beskerming teen brand.
17. Gebruiklike spanningsgrens vir gs. en die maksimum kontakspanningsduur vir gs.
18. Gs.-spanningsgolwe.
19. Veiligheidsdienste en gereedheidsvoorrade.
20. Gids oor veiligheidsreëls vir installering van verhittingskabels en -toestelle (binnenshuise aanwending).

    Hierdie punt het interessante besprekings oor die aanwending van verhittingskabels en -eenhede in mure uitgelok.

Bogenoemde verslag sal hopelik 'n aanduiding gee van die omvang en verskeidenheid van onderwerpe waarvoor Tegniese Komitee No. 64 verantwoordelik is.

KOMITEE VAN AKSIE

Die Komitee van Aksie het vergader onder voorsitterskap van die President van die IEK, Akademikus V. I. Popkov, lid van die USSR Akademie van Wetenskappe.

Die volgende lande is lede van die Komitee van Aksie:

Australië	Japan
Kanada	Turkye
Finland	Verenigde Koninkryk
Duitsland	Verenigde State van Amerika
Hongarye	

Ek en mnr. Middlecote het die vergaderings van hierdie komitee as waarnemers bygewoon.

important committees of the IEC, took place under the chairmanship of the leader of the South African delegation, Mr. A. A. Middlecote.

Amongst the more important items on a long agenda which were discussed were:

1. Protection against over current.
2. Measures of protection against electric shock.
3. Measures of protection against over current.
4. Switchgear and controlgear (for protection, isolation and switching).

   South Africa had indicated its special interest in this subject and had submitted a detailed comment. It was decided that the South African National Committee be asked to review its proposal in the light of the other comments which had been submitted and forward any further proposals to the relevant Working Group for the production of a new draft.
5. Current carrying capacity of conductors and related over current protection.
6. Effects of current passing through a body.
7. Voltage Bands.
8. Demand and diversity.

   This item evoked considerable discussion and the discussion concentrated on the question of the nature of the demand factor and its application.

   As no agreement could be reached an Ad-Hoc Working Group was set up to study the problem and a written report was submitted by the Ad-Hoc Working Group to the last session of the meeting. This report was to be studied by the relevant Working Group.
9. Initial inspection and testing.
10. Isolation and switching.
11. Safety devices and standby supplies.
12. Identification of Conductors.
13. Construction site installations.
14. Canalisations.

    Amongst the more interesting points to emerge from discussions were that the title "Wiring Systems" instead of "Canalisations" was accepted and that the terms "Admissible Current" and "Ampacity" should not replace the term "Current Carrying Capacity."
15. Earthing and Protective Conductors.
16. Protection against fire.
17. Conventional voltage limit for d c and the maximum touch voltage duration for d c.
18. d c Voltage bands.
19. Safety services and standby supplies.
20. Guide on safety rules for installation of heating cables and heating products (indoor applications).

    This item produced interesting discussion on the application of heating cables and heating units in walls.

Hopefully the above report will give some indication of the range and diversity of subjects for which Technical Committee No. 64 is responsible.

COMMITTEE OF ACTION

The Committee of Action met under the chairmanship of the President of the IEC, Academican V. I. Popkov who is a member of the USSR Academy of Sciences.

The following countries are members of the Committee of Action:

Australia	Japan
Canada	Turkey
Finland	United Kingdom
Germany	United States of America
Hungary	

Mr. Middlecote and I attended the meetings of this committee as observers.

Behalwe die oorweging vir goedkeuring van 'n aansienlike getal verslae van Tegniese Komitees wat sedert die 41ste algemene vergadering in Nice in Mei 1976 voorgelê is en verslae wat op 31 Mei 1977 nog nie by korrespondensie goedgekeur is nie, is 'n aantal ander punte bespreek, waaronder die volgende:

1. Nywerheidsprosesmeting en beheer.
2. Veiligheid van dataverwerktoerusting en kantoormasjiene.
3. Gereedskap en toerusting wat in lewendige lynwerk gebruik word.
4. Isoleerkoördinasie vir laespanningstoerusting.
5. Elektromagnetiese aan-asbaarheid.
6. IEK werksaamhede op die gebied veiligheid.
7. IEK werksaamhede op die gebied van elektronika en telekommunikasiewese.
8. Organisering van werk aan modulêre stelsels.
9. Vlambaarheid.
10. Omgewingstoetsing.
11. Versoek van die Union of producers, Conveyors and Distributors of Electric Energy in African Countries, Madagascar and Mauritius (U.P.D.E.A.) insake hulp van die IEK om te besluit oor 'n standaard-spanningsbestek vir gebruik in U.P.D.E.A.-lidlande.

    Hierdie punt het 'n groot mate van bespreking uitgelok en daar is besluit dat die IEK aan die versoek gehoor moet gee en dat die nodige deskundiges benoem sou word met dien verstande dat die benoeming van sodanige deskundiges hoegenaamd geen verantwoordelikheid of verpligting aan die kant van die IEK sal inhou nie.

Die Komitee van Aksie het ook verslae van verskeie Tegniese Komitees wat net voor die vergadering van die Komitee van Aksie in Moskou byeengekom het, ontvang, oorweeg en daaroor besluit.

Die volgende punte is onder andere oorweeg:

1. T C 1: Terminologie — opstelling van 'n woordeboek.
2. T C 10: Vloeistof- en gasdiëlektrikum.
3. T C 17: Skakeltuig en beheeruitrusting.
4. T C 18: Elektriese installasies in skepe.
5. T C 32: Sekerings.
6. T C 47: Halfgeleiertoestelle en geïntegreerde bane.
7. T C 50: Omgewingstoetsing.
8. T C 61: Veiligheid van huishoudelike elektriese toestelle.
9. T C 62: Elektriese uitrusting in mediese praktyk.
10. T C 64: Elektriese installasies van geboue.
11. T C 76: Lasertoerusting.
12. T C 77: Elektromagnetiese aanpasbaarheid tussen elektriese toerusting insluitende netwerke.

Verlenging van ampstermyn van Voorsitter van Tegniese Komitee No. 64: Elektriese Installasie van Geboue

Van besondere betekenis vir Suid-Afrika was die besluit van die Komitee van Aksie om kennis te neem dat die ampstermyn van mnr. A. A. Middlecote van Suid-Afrika as voorsitter van Tegniese Komitee No. 64 by korrespondensie deur lede goedgekeur is.

Mnr. Middlecote moet van harte gelukgewens word met sy uitstekende prestasies gedurende sy lang ampstermyn van hierdie belangrike Tegniese Komitee van die IEK. Hy het vir die Nasionale Komitee van die IEK, die Suid-Afrikaanse Buro vir Standaarde en vir Suid-Afrika agting verwerf.

RAAD VAN DIE I.E.K.

Die vergadering van die Raad van die I.E.K., met dr. V. I. Popkov as President, is deur 96 afgevaardigdes bygewoon.

By die oorweging van die kwessie van toekomstige algemene vergaderings van die I.E.K., het die leier van die Israeliese afvaardiging die mening uitgespreek dat die Raad oorweging moet skenk aan die moontlikheid dat 'n uitnodiging by een of ander toekomstige geleentheid ontvang moet word van 'n regering wat teen die binnekoms van afgevaardigdes van sekere lande beswaar mag maak. Hy het voorgestel dat die Raad 'n besluit aanneem dat daar nie in enige land wat so mag optree, vergader sou word nie.

As well as considering for approval a considerable number of reports from Technical Committees submitted since the 41st General Meeting held in Nice in May 1976 and reports not yet approved by correspondence as at the 31st May 1977, a number of other items were discussed, amongst which were:

1. Industrial process measurement and control.
2. Safety of data processing equipment and office machines.
3. Tools and equipment used in live line work.
4. Insulating co-ordination for low voltage equipment.
5. Electromagnetic compatibility.
6. IEC activity in the field of safety.
7. IEC activity in the field of electronics and telecommunications.
8. Organisation of work on modular systems.
9. Flammability.
10. Environmental testing.
11. Request from the Union of Producers, Conveyors and Distributors of Electric Energy in African Countries, Madagascar and Mauritius (U.P.D.E.A.) regarding help from the IEC to select a standard range of voltages for use in UPDEA member countries.

    This item evoked a good deal of discussion and it was agreed that the IEC should respond to the UPDEA request and that the necessary experts would be nominated, it being understood that the nominations of these of these experts would in no way imply any responsibility nor any obligation on the part of the IEC.

The Committee of Action also received, considered and decided upon reports which were received from various Technical Committees which had met in Moscow, just prior to the meeting of the Committee of Action.

1. T C 1: Terminology — preparation of a dictionary.
2. T C 10: Liquid and gaseous dielectrics.
3. T C 17: Switchgear and controlgear.
4. T C 18: Electrical installations in ships.
5. T C 32: Fuses.
6. T C 47: Semiconductor devices and integrated circuits.
7. T C 50: Environmental testing.
8. T C 61: Safety of household electrical appliances.
9. T C 62: Electrical equipment in medical practice.
10. T C 64: Electrical installations of buildings.
11. T C 76: Laser equipment.
12. T C 77: Electromagnetic compatibility between electrical equipment including networks.

Extension of the Term of Office of Chairman of Technical Committee No. 64: Electrical Installations of Buildings

Of special significance to South Africa was the decision of the Committee of Action to note that the term of office of Mr. A. A. Middlecote of South Africa as chairman of Technical Committee No. 64 had been approved by the members by correspondence.

Mr. Middlecote is to be sincerely congratulated on his outstanding achievements during his long term of office of this important Technical Committee of the IEC. He has brought honour to the National Committee of the IEC, the South African Bureau of Standards and South Africa.

COUNCIL OF THE I.E.C.

The Council of the I.E.C., met under the Presidency of Dr. V. I. Popkov and was attended by 96 delegates.

In considering the matter of future general meetings of the I.E.C., the leader of the Israeli delegation expressed the view that the Council should consider the possibility on some future occasion of an invitation being received from a government which might object to the entrance of delegates from certain countries. He suggested that the Council should adopt a resolution to the effect that it would not meet in any country which might do so.

Die President het verklaar dat daar slegs by een geleentheid in die verlede 'n mate van misverstand in hierdie verband opgeduik het en dat hy hoop dat dit nooit weer sou gebeur nie. Lande wat 'n uitnodiging aan die I.E.K. rig, moet besef dat hulle die organisasie in sy geheel uitnooi en sodoende alle Nasionale Komitees sonder uitsondering. Hy het die aanneming van 'n spesiale besluit oor die saak deur die Raad nie nodig geag nie.

Onder die ander sake wat bespreek is, was:

1. Skakeling tussen die I.E.K. en die Internasionale Standaarde-organisasie.
2. Die gesamentlike publikasie van handleidings deur die I.E.K. en die I.S.O.
3. Finansies.
4. Die herbepaling van die take van die Komitee van Aksie.
5. Die verkiesingsmetode van drie bykomende lede van die Komitee van Aksie.
6. Algemene aanwysings vir die werk van die I.E.K. ten opsigte van "nuwe werk".
7. Stemming en die nasionale implikasies daarvan.
8. Voorstelle van die U.S.S.R. Nasionale Komitee insake verslae van Tegniese Komitees.

Verkiesing van die President van die I.E.K.

Vir die eerste keer in die geskiedenis van die I.E.K. is twee nominasies vir die amp van President ontvang, naamlik dr. L. Podolsky (Verenigde State van Amerika) en prof. N. Tagaki (Japan).

Na 'n stemming is prof. Tagaki tot President verkies.

SEKERE INDRUKKE

Ek is nou des te meer oortuig dat dit 'n wyse besluit van die V.M.E.O. was dat die President van die V.M.E.O. gemagtig word om gedurende sy ampstermyn van twee jaar een vergadering van die I.E.K. by te woon en dat 'n benoemde van die Uitvoerende Raad van die V.M.E.O. teenwoordig sal wees by die I.E.K.-vergadering waar die President nie 'n afgevaardigde is nie.

Die teenwoordigheid van die Suid-Afrikaanse afvaardiging by 'n Algemene vergadering van die I.E.K., is op internasionale vlak vir hierdie land van groot waarde. As die hoogste geïndustrialiseerde land op die vasteland van Afrika, moet Suid-Afrika seker maak dat hy by hierdie soort internasionale konferensie deur organisasies van die gehalte van die V.M.E.O. verteenwoordig word.

ALGEMEEN

Elke afgevaardigde kon nie anders nie as om onder die indruk te kom van die prestasies van die elektrisiteitsnywerheid van die U.S.S.R. sedert 1921, toe die projek vir die elektrifisering van die hele Rusland van stapel gestuur is.

Besonderhede van die merkwaardige ontwikkelings is by die amptelike opening van die vergadering in die kunsteater van Moskou deur vooraanstaande akademici van die U.S.S.R. Akademie van Wetenskappe verstrek.

Die elektriese kragnywerheid in die U.S.S.R. het die ingebruikneming, gedurende die tydperk 1976/1980, van 'n bykomende 65 000 — 70 000 MW nuwe ontwikkelvermoë, waarvan 13 000 — 15 000 in kern-ontwikkelinstallasies sou wees, in die vooruitsig gestel. Turbo-ontwikkelaars met 'n 1 000 — 13 000 MW aanslag sal in kern- en termiese kragsentrales geïnstalleer word en transmissielyne wat teen spannings van 1 500 kV gs en 1 150 kV ws werk, sal opgerig word.

Die vervaardiging van 800 MW 3 000 opm turbo-ontwikkelaars met waterverkoelde rotorwikkelings was in 1977 aan die gang. Daar is van nuwe materiale gebruik gemaak om uitstaande hitte- en trillingkenmerke en verbeterde rendemente te verkry. Dit het gelei tot die vervaardiging van die eerste 1 200 MW 3 000 opm turbo-ontwikkelaar. Na voltooiing van toetse by die aanleg sou dit by die Kostromskaya termiese kragsentrale geïnstalleer word.

Sedert 1972 is 'n 1 000 MVA 330 kV driefasige verhogingstransformator met 'n 800 MW turbo-ontwikkelaar in gebruik geneem, terwyl 'n 2 000 MVA 1 150/550 kV outotransformator in ontwerp was. Dit sal in werking gestel word op 'n eksperimentele 1 150 kV nywerheidskoppellyn tussen die 500 kV transmissienetwerke van Siberië en Kuzbass.

Ook in bedryf in 1977 is gs transformatorsubstasie was tiristoreenhede aangeslaan op 65 MW 235 kV, verkoel deur gedeïoniseerde water en onder laserbeheer om geruisstabiliteit van toerusting te verseker.

The President stated that in the past there had been only one occasion when there had been some misunderstanding in that connection and said that he hoped it would never occur again. Countries which issued an invitation to the I.E.C., must realise that they were inviting the organisation as a whole and hence all its National Committees without exceptions. He did not consider it necessary for Council to adopt a special resolution on the subject.

Some of the other matters discussed, were:

1. Liaison between the I.E.C. and the International Standards Organisation.
2. The joint publication of Guides by the I.E.C. and the I.S.O.
3. Finance.
4. The re-definition of the tasks of the Committee of Action.
5. The method of election of three additional members of the Committee of Action.
6. General directives for the work of the I.E.C. concerning "new work".
7. Voting and its national implications.
8. Proposals from the U.S.S.R. National Committee concerning reports from Technical Committees.

Election of the President of the I.E.C.

For the first time in the history of the I.E.C., two nominations for the position of President had been received, namely Dr. L. Podolsky (United States of America) and Prof. N. Takagi (Japan).

After a ballot Prof. Takagi was elected president.

SOME IMPRESSIONS

My conviction has been strengthened that the A.M.E.U. made a wise decision that the President of the A.M.E.U. be authorised to attend one meeting of the I.E.C. during his two year term of office and that a nominee of the Executive Council of the A.M.E.U. shall attend the meeting of the I.E.C. at which the President is not a delegate.

The presence of the South African delegation at a General Meeting of the I.E.C. has great value for this country at an international level. As the most highly industrialised country on the African continent, South Africa must ensure that it is represented at this kind of international conference by organisations of the standing of the A.M.E.U.

GENERAL

No delegate cannot but have been impressed by the achievements of the electrical industry in the U.S.S.R. since 1921, when the project for electrification for the whole of Russia was launched.

Details of remarkable developments were given at the official opening of the meeting in the Moscow Arts Theatre by prominent Academicians of the U.S.S.R. Academy of Sciences.

The electrical power industry in the U.S.S.R. envisaged the commissioning in the period 1976/1980 of an additional 65 000—70 000 MW new generating capacity of which 13 000—15 000 MW will be in nuclear generating plants. Turbo-generators of 1 000—1 300 MW rating will be installed in nuclear and thermal power stations and transmission lines operating at voltages of 1 500 kV dc and 1 150 kV ac will be erected.

In factory production in 1977 were 800 MW 3 000 rpm turbo-generators with water cooled rotor windings, using new materials to obtain outstanding heat and vibration characteristics and improved efficiencies. This led to the production of the first 1 200 MW 3 000 rpm turbo-generator. After the completion of tests at the plant it was to be installed at the Kostromskaya Thermal Power Station.

Since 1972 a 1 000 MVA 330 kV 3 phase step-up transformer operating with an 800 MW turbo-generator has been commissioned, while a 2 000 MVA 1 150/550 kV auto transformer was in design. This will operate on an experimental industrial 1 150 kV tieline inter-connecting the Siberia and Kuzbass 500 kV transmission networks.

Also in service in 1977 in dc transforming substations were thyristor units rated at 65 MW 235 kV cooled by deionised water and laser controlled to ensure equipment noise stability.

At last. Some good news from Britain for South African electricity undertakings.

FNA series Polyphase meter.

Type F2Q-100 Single phase meter. (Polycarbonate clear cover at no extra cost).

Type FPQ-102 Single phase pre-payment meter.

This year the news from Britain has been pretty bleak. But every cloud has a silver lining and amid the news of strikes and stoppages comes great news for South African industry.

Sulzer Bros. (South Africa) Ltd are pleased to announce that the Meter Section of their U.K. principals, Ferranti Instruments Limited have become equal partners with Siemens in a joint venture company, Ferranti Measurements Limited. The company will manufacture industrial and commercial electricity meters.

How will this merger affect suppliers of electricity in South Africa?

Ferranti Measurements will enjoy the technical expertise and extensive combined experience of both companies involved in this joint venture. This expertise is passed on to you, the buyer, in the very finest quality metering systems.

In addition a large capital investment will enable the company to engage in further design and research work to ensure a continual flow of new, top quality, products.

How can Sulzer help?

Sulzer are sole agents in South Africa for Ferranti Measurements Limited. Our association will continue as in the past. The finest products and the finest service for our customers. Sulzer will also continue to locally manufacture single phase meters, in standard and polycarbonate clear covers.

For more information on the wide range of electrical meters available, contact Sulzer today. We can measure up to your requirements.

FERRANTI

SULZER

Sulzer Bros. (South Africa) Ltd.
Johannesburg: Sulzer House, 260 Market Street, Jeppestown. P.O. Box 930, 2000. Tel. 618-4125. Cape Town: 15 Napier Street, P.O. Box 6913, Roggebaai. 9012. Tel. 41-8329. (From approx. mid-'79 21-5650/1/2.). Durban: 39 Station Road, Stamford Hill. P.O. Box 1877, 4000. Tel. 33-5543.

Twee lengtes gasgeïsoleerde 220 kV kabels is in 1975 in Moskou en in 1976 in Leningrad geïnstalleer. 'n Mengsel van stikstof en 10 persent swaelheksafluoried is as isoleermiddel gebruik.

'n Boeiende beskrywing is gegee van die grondbeginsel van die ontwerp van die magnetohidrodinamiese elektriese kragontwikkelaar waarin die gebruiklike wikkeling van die generatoranker vervang is deur 'n straal gesmelte metaal of 'n stroom plasma (verysterde gas) verhit tot sowat 2 500/3 000 grade C .

Met 'n betreklik klein toename in totale kapitaaluitgawe, kan 'n kragsentrale met MHD ontwikkelaars 'n aanvanklike rendement van 50 persent tot 60 persent hê, met 'n brandstofbesparing van 20 persent vergeleke met 'n kragsentrale wat die gewone ontwikkelaars gebruik.

Die wêreld se eerste eksperimentele MHD elektriese kragsentrale is in 1965 voltooi, terwyl die U-25 MHD aanvoorinstallasie in 1971 die enigste van sy soort in die wêreld was en waarskynlik die prototipe van industriële MHD-eenhede van die toekoms is.

Die U.S.S.R. en V.S.A. het saamgewerk aan 'n M.H.D.-program ingevolge waarvan die V.S.A. binnekort 'n supergeleidende magnetiese stelsel, vervaardig deur die Argon National Laboratory van die V.S.A., sal bydra om saam met 'n M.H.D. ontwikkelaar te werk. Die V.S.A. sal in ruil daarvoor die geleentheid kry om in samewerking met ingenieurs van die U.S.S.R., navorsing te doen oor die U-25 installasie.

SLOT

Aangesien ek nie 'n lid van die Suid-Afrikaanse Nasionale Komitee van die I.E.K. was nie, was my tegniese bydrae by die konferensiesittings gering. Die geleenthede om op amptelike vlak internasionale skakels te handhaaf en op persoonlike vlak voeling met verteenwoordigers van so baie lande te bewerkstellig, was egter van besondere waarde.

Ek is die V.M.E.O. werklik groot dank verskuldig vir 'n onvergeetlike ondervinding.

In Moscow in 1975 and in Leningrad in 1976 two lengths of gas insulated 220 kV cables were installed using a mixture of nitrogen and 10% sulphur hexafluoride as the insulating medium.

A fascinating outline was given of the principle underlying the design of the magnetohydrodynamic electric power generator, in which the conventional winding of the generator armature is replaced by a jet of molten metal or a stream of plasma (ironised gas) heated to about 2 500/3 000 degrees C .

With a relatively small increase in total capital expenditure a power station with M.H.D. generators could have an initial efficiency of 50% rising to 60% with a fuel saving of 20% compared with a power station using conventional generators.

The world's first experimental M.H.D. electric power station was completed in 1965 while in 1971 the U-25 pilot M.H.D. installation was the only one of its kind in the world and is probably the proto type of industrial M.H.D. units of the future.

The U.S.S.R. and the U.S.A. were co-operating on an M.H.D. programme in which in the near future the U.S.A. will contribute a superconductive magnetic system produced by the U.S.A. Argon National Laboratory to work in conjunction with an M.H.D. generator. In return the U.S.A. will be given the opportunity to carry out research on the U-25 installation in conjunction with engineers of the U.S.S.R.

CONCLUSION

Not having been a member of the South African National Committee of the I.E.C., my technical contribution in the conference sessions was insignificant. However, the opportunities presented to maintain international contracts at official level and to establish contacts with representatives of so many countries were of special value.

I am indeed grateful to the A.M.E.U. for an unforgetable experience.

MR. P. J. BOTES, President:

Well, ladies and gentlemen Mr. Robson's report and his remarks on the remarkable developments in Russia are quite interesting. They have achieved interesting results in the transmission of power supplies as well as in experiments with the magnetohydro-dynamic electric power generator. However, we are pleased to have Ken back with us and not lost to the Russians, thank you Comrade Robson.

REPORT ON OVERSEAS STUDY TOUR RE. WIRING SYSTEMS BY REPRESENTATIVES OF THE DEPARTMENT OF LABOUR, THE ELECTRICAL CONTRACTOS' ASSOCIATION OF SOUTH AFRICA AND THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTH AFRICA — JULY, 1978

1.0 INTRODUCTION AND HISTORICAL BACKGROUND

1.1 During May/June, 1976, Mr. J. V. Grant of the South African Bureau of Standards visited Britain and Germany for a short period to study electrical wiring systems in use in those countries. He subsequently reported to the SABS in which he described the various types of wiring systems used and in view of potential cost savings recommended that a detailed investigation be undertaken to confirm their suitability for South African conditions. This report was made available to various interested bodies, including all those represented on the SABS Committee responsible for the Wiring Code and the National Development Fund of the Building Industry.

1.2 Subsequently during 1977, Messrs. J. P. van Straaten and M. D. Sage, members of the staff of the national Building Research Institute (NMRI) of the Council for Scientific and Industrial Research, undertook a similar independent investigation of wiring systems in use in Britain, Germany, Sweden and Portugal. In the report on their investigation they indicated that there appeared to be no reason why all the systems presently used in these overseas countries should not be legalised in South Africa.

1.3 Following consideration of the report by Messrs. van Straaten and Sage, the NBRI suggested that representatives of the Municipalities in South Africa and the Department of Labour who presently carry the major responsibility for the inspection and testing of electrical installations and the approval of wiring installations and materials, together with the licensing and registration of Electrical Wireman and Contractors, should proceed overseas in order to assess these systems from the point of view of safety and suitability to the environmental conditions and style of the useage by consumers in South Africa. It was also considered desirable for representatives of the Electrical Contractors' Association of South Africa to participate in this assessment. The suggestion of the NBRI was accepted by the Department of Labour, the Association of Municipal Electricity Undertakings of South Africa (AMEU) and the Electrical Contractors Association and a delegation of five was duly appointed as follows:

Messrs. A. A. Weich — Chief Inspector of Factories — Department of Labour.

D. Kneale — Electrical Contractors' Association of South Africa.

R. Wilken — Electrical Contractors' Association of South Africa.

J. K. von Ahlften — AMEU of South Africa.

D. H. Fraser — AMEU of South Africa.

It should also be noted that Messrs. Weich, Kneale and von Ahlften are members of the Electrical Wiremen's Registration Board and that Messrs. Weich, von Ahlften, Wilken and Fraser are members of the SABS Main Committee responsible for the Wiring Code.

Mr. Kneale is also a member of the AMEU Recommendations Committee for new commodities.

2.0 SCOPE OF INVESTIGATION

2.1 The tour embraced discussions with representatives of authorities responsible for the preparation of wiring regulations, the registration of Electrical Contractors, the inspection of electrical installations, Local Authorities responsible for the provision and maintenance of housing on a large scale, including the installation and maintenance of electrical wiring systems in such buildings and Manufacturers of electrical wiring materials and accessories and Electrical Contractors responsible for the installation, extension or repair of wiring installations. A number of visits were made in manufacturers' works and to building sites where electrical wiring work was in progress. The tour was confined to Great Britain, Germany, France and Portugal according to the following programme.

	DATE	LOCATION
2.2	3/7/78	Pirelli, General Works, Southampton, England.
2.3	4/7/78	Offices of the Institution of Electrical Engineers, Savoy Place, London.
2.4	5/7/78	Glasgow, Corporation, Scotland.
2.5	6/7/78	Simplex Wiring Devices Limited, Liverpool, England.
2.6	7/7/78	Ward & Goldstone — Manchester, England.
2.7	10/7/78	Octopus Electric Ltd., Shrewsbury, England.
2.8	12/7/78	Greater London Council (GLC) Mechanical & Electrical Engineering Department, Dartmouth Street, London.
2.9	13/7/78 to 15/7/78	Siemens A. G. Erlangen, Germany.
2.10	17/7/78	Offices of Verband: Deutscher Electrotechniker (V.D.E.) & Zentral Verband Der Electrotechnischen Industrie (Z.V.E.I.) in Frankfurt, Germany.
2.11	18/7/78	Offices of Federation Nationale de l'Equipement Electrique (FNEE) & Federation des Industries Electriques et Electroniques (FIEE) in Paris.
2.12	21/7/78	S.A. Embassy — Lisbon Portugal.

NATURE OF VISIT/DISCUSSION

Discussion with Messrs. Penton, Bryant and Williams of Pirelli General Limited on progress in the establishment of common standards for wiring cables and associated products in the major Western European countries under a process known as 'Harmonisation'. Information was given regarding the various types of cables and insulated wires manufactured for use in Britain and Europe in electrical installations in buildings. Some details of wiring practices and for the formulation and inforcement of wiring regulations were also provided.

Discussion with —
Messrs. John Marlowe, Snr. Technical Officer, I.E.E.

J. Roper, Electrical Contractos' Association.

T. Howell, National Inspection Council.

Detailed information was provided concerning the procedures in Britain for the formulation of Wiring Regulations, the assessment of new techniques (ANT), the arrangement for inspection and testing of new installations, the function of the National Inspection Council and the system of registration of Electrical Contractors, the function of the Electricity Supply Authority in respect of testing and installation. Details were provided of wiring systems in use in Britain, the protection systems used and accident experience.

Discussions with Mr. Croft (Chief Electrical Engineer) and Mr. Rob Nisbett concerning metal sheathed flat twin and earth wiring cable in Glasgow and site inspections where re-wiring in Municipal owned flats was being undertaken by Contractors.

Discussions with Messrs. Ken Hughes and Don Smith followed by factory inspection and a city visit where the Company's pre-wired multi-bore conduit kits were being installed in about 500 new Council owned flats. Information was given concerning the manufacture and use of multi-bore conduit and the fabrication by this manufacturer of pre-wired kits for use in repetitive type wiring installations. Background information to the development of the metal protected systems specifically for the Glasgow Corporation, was provided.

Discussions with Messrs. Coates, Aspin, Todd & Button regarding Volex pre-wired multi-bore conduit system and the range of products and accessories manufactured by this firm, including mini-trunking. A site visit to a new Council Housing development followed, where the installation of pre-wired milti-bore conduit flat twin and earth PVC cabling was in progress.

Visit to the Company's factory manufacturing pre-wired multi-bore conduit systems and other products followed by a site inspection where installation of this firm's wiring systems was in progress. (Mr. Hulme).

Discussions with Mr. Payne and other members of his staff concerning the practices and operational experience in respect of electrical installations in buildings falling under the jurisdiction of th G.L.C. This was followed by a site inspection of new multi-storey low rise housing developments and houses in which re-wiring, using surface mounted mini-trunking, had been undertaken.

Site inspection of wiring installation in progress in a new privately owned house, discussions on German wiring practice and systems of wiring installation in use and a visit to the Siemens Research Centre. Various members of Siemens staff were involved in these arrangements, including Messrs. Steiner, Haak, Klose, Mayer and Schultz. After completion of the programme relating to electrical installations in buildings, which included an inspection of wiring in a new multi-storey office under construction, the South African delegates, with the exception of Mr. Weich, took part in discussions with Siemens Power Engineering staff on SF6 high voltage switchgear and were conducted on a tour of inspection of a pumpted storage scheme in Happburg near Nürenburg by Mr. Stadelmeier and Dr. Anastasiadis.

Discussions with Messrs. Lehmann, Hartmann, Simon and Fuhr on main types of wiring systems used in Germany, the function of V.D.E. in respect of the drafting of wiring regulations, the arrangements regarding the registration and training of electricians engaged on wiring work in Germany, accident statistics, electricity supply arrangements, operating experience with wiring systems, protection and earthing in electrical installations and inspection and testing of wiring work.

Discussions and site inspection with:

Messrs.	Representing
B. Clermont	F.N.E.E. (Contractors Assce.)
C. Rèmond	Union Technique Der Electricity (U.T.E.) (Wiring Regs. Authority)
Govy	Et Legrand (Manufacturer)
C. Lecomte	F.I.E.E. (Manufacturers Association)
Nierenberger	A.M.I.C.A. (Manufacturer)

Bons A.M.I.C.A. (Manufacturers)

Information was provided regarding the responsibility for Wiring Regulations and the French philosophy in respect of wiring of buildings, testing and inspection of installations, protection systems, training and licensing of electricians engaged in wiring work.

Discussions with —
Messrs. G. Martins representing Direceao Geral dos Servicos Electricos (the National Wiring Regulations Authority) and H. Rocha — President of D.G.S. Electricos. E. Santos — Representative of the State Housing Department.

Information was given regarding the systems of wiring used in Portugal which followed closely the French system, the form of protection used in wiring installations, the procedure for testing and inspection of installations and the types of accessories used.

3.0 WIRING SYSTEMS AND MATERIALS

Note: As the various systems in use in Britain and Europe have been described in some detail in the reports of Messrs. van Straaten and Sage of the N.B.R.I. and Mr. Grant of the S.A.B.S., they will only be referred to briefly in this report.

3.1 Great Britain

3.1.1 Twin and earth cable

In this cable PVC insulated phase and neutral conductors are laid up with a bare copper earth wire in flat formation and a tough PVC sheath is extruded overall. The cable is manufactured to a British Standard Specification and requirements for its use are specified in the I.E.E. Wiring Regulations. It may be installed on the surface, directly buried under plaster and protected by a steel or plastic capping or in a conduit depending on whether or not the system is required to be re-wireable, in cavities or in floor or roof spaces. In accessible ceiling spaces the cable is fastened to roof timbers to minimise risk of damage. This type of cable is extensively used for the wiring of domestic premises and has given satisfactory results over a long period. 1,5 mm² conductors are normally used for lighting circuits and 2,5 mm² for ring main socket outlet circuits, solid conductors generally being used in these sizes.

3.1.2 Mechanically protected cable

This cable is similar to the flat twin and earth but has a readily removable galvanised steel armouring over the PVC sheath to serve as an earth screen. The cable was developed in response to requirements specified by Glasgow Corporation where the incidence of malicious damage and mis-use of wiring installations was apparently a problem. The cable is installed in a similar manner to the flat twin and earth but is obviously more expensive in material cost. It does not appear to be used in any of the other centres visited in the United Kingdom.

3.1.3 Multibore Conduit

This conduit is produced by several manufacturers in Britain with minor variations. The conduit is very flexible and provides individual tunnels in flat formation to accommodate conductors with PVC insulation. One manufacturer extrudes the conduit over the PVC insulated wires so that there is no limit to the length of pre-wired conduit. Other manufacturers insert the insulated conductors after extrusion of the multi-bore conduit sometimes in individual lengths required for the particular installation or in coils of limited length. In repetitive type installations the pre-wired multi-bore conduit is made into kit form to reduce installation time. The system was seen in use in a number of building sites and appears to be sufficiently robust to withstand the normal amount of rough treatment by building trades during the process of installation in concrete floor and roof slabs and in walls, prior to plastering.

The system is said to be re-wireable but in practice it appeared that this would depend on the sharpness and number of bends between draw-in points. The system is not suitable for surface installations from aesthetic, mechanical protection and probably cost considerations. Proper grading of the PVC to suit temperature considerations is necessary.

3.1.4 Mini-trunking

This system is suitable for surface work and produces a neater appearance than round or oval conduit as saddles or fastening hooks are not necessary, the trunking being fixed by screws through the back wall of the trunking. Wiring of course has to be carried out on site. The system is presently permissible under the South African Wiring Regulations.

3.1.5 Re-wireability of Installations

Both the twin and earth and metal protected cables may be accommodated in round or oval conduit if a re-wireable system is required. Except in concrete, the I.E.E. regulations do not specify re-wireability as a requirement, this being left to the individual or authority concerned. In Glasgow the system being installed in the buildings inspected was not rewireable, the metal protected cables being buried directly in the plaster while the Greater London Council used oval plastic conduits in walls to accommodate the twin and earth cable and multi-bore conduit in floor slabs so as to provide a re-wireable system. These wiring systems lend themselves more readily to "do-it-yourself" installation according to the G.L.C.

3.2 Germany

3.2.1 Under plaster flat cable

This cable which was developed to speed up wiring work in the post-war reconstruction of damaged buildings, consists of two to five PVC insulated conductors laid up in flat formation spaced and held together with an easily strippable soft rubber or PVC web. The cable is used only under plaster, requiring a 10 mm cover by regulation, and is run vertically or horizontally, positioned where damage through picture nails, etc., is unlikely to occur. The cable is fastened to the wall prior to plastering by nailing or glueing by special adhesive and from information received it appears that some damage by building tradesmen is experienced, necessitating repair before the installation is completed. This system is however, extensively used for the wiring of domestic type dwellings in Germany although it is not accepted by the I.E.C. or other European countries. This cable is covered by VDE specifications 0100 and 250. The thickness of the PVC insulation, which appears to be a particularly hard grade, is 0,4 mm and as the cable is not used in countries outside Germany, it is not contemplated that this will be increased to conform to the Harmonised European Standard of 0,7 mm .

3.2.2 Circular PVC Sheathed Cable

This cable has PVC insulated solid conductors with a soft plastic bedding to produce a circular shape and facilitate stripping. A tough PVC sheath is extruded overall. Solid conductors are used up to and including 10 mm². The cable may be used under plaster, on the surface of walls, in exposed ceiling spaces or in raised floors or false ceilings. Type NYY may be used in any situation including underground. The sheath incorporates carbon black for protection against ultra-violet rays while type NYM has a slightly thinner sheath and is coloured white.

Insulation thickness is 0,6 mm but this will be increased to the Harmonised Standard of 0,7 mm for cables exported from Germany. PVC compound mixtures will be standardised after harmonisation.

3.2.3 Re-wireability of Installations

The German philosophy regarding wiring of domestic premises appears to be that the original installation should provide sufficient socket outlets and other facilities and current carrying capacity for future requirements so as to make re-wiring or additions, including "do-it-yourself" extensions, unnecessary. Operating experience indicates that re-wiring due to deterioration of PVC insulation is not likely to be necessary. From the limited site inspections undertaken it appears that wiring in domestic buildings in Germany is mainly accommodated in the walls or in the ceiling spaces, avoiding concrete decks and floor slabs. Light fittings are generally wall mounted or standard lamps are used where there is no ceiling.

3.3 France

3.3.1 Flexible PVC Smooth Walled Tubing

This product resembles a plastic hose pipe and may be coiled into fairly small diameter rolls such that it can be prefabricated into conduit kits for repetitive type work. A wide range of light guage plastic accessories and boxes are available and the system is particularly suited for installation in present concrete floor and wall elements which were used in the site visited in Paris and obviously permits very speedy installation in concrete decks. There was no indication by the Electrical Contractors that damage during pouring of concrete or fixing of steel reinforcing was a par-

ticular problem. Two grades of PVC were used, one being coloured orange for use in concrete, the other grey which is a non-flammable type and is used where it is exposed. A corrugated PVC conduit is also used for special situations, e.g. in partition walls and terminations at distribution boards, etc., where greater flexibility is required.

3.3.2 The wiring of the conduits may to some extent be carried out before installation but in the site visited the wiring was undertaken as a separate operation. PVC insulated solid conductors up to 2,5 mm sq. are used.

3.3.3 **Re-wireability.**

The French philosophy appears to be that wiring installations should be totally rewireable. The French wiring system does not lend itself to "do-it-yourself" installations.

3.4 **Portugal**

3.4.1 Flat PVC sheathed cable similar to that used in Britain has been used for surface mounting in the existing houses in sub-economic housing schemes which were not originally wired for electricity. This cable is not used in new buildings under plaster or in cavaties.

3.4.2 Flexible PVC conduit similar to that used in France and rigid plastic conduit is used for the wiring of new buildings.

3.4.3 Separate circuits are provided for socket outlets and lighting, in separate conduits.

3.4.4 PVC conduit is run vertically or horizontally, not diagonally, in walls.

3.4.5 Portuguese wiring regulations specify re-wireability as a mandatory requirement.

3.4.6 PVC conduit is not permitted for use out doors and black sheaths are required on cables used out doors.

4.0 CONDUCTOR SIZES:

4.1 In Great Britain and Europe extensive use is made of solid copper conductors in wiring cables in preference to stranded and these are permitted up to 6,0 mm². The stiffer cable resulting from the use of solid conductors has some advantage, e.g. is easier to push into conduits, the overall diameter of the cable is reduced requiring less space in wireways and boxes and in the multi-bore flat or circular form the added rigidity is an advantage where the cables are fixed directly to walls or timbers.

4.2 **Earth Wires**

Economy of material is achieved in Britain and Europe by permitting earth wires below 2,5 mm sq which is the South African standard. The minimum sized earth wire in Britain is 1 sq mm while Germany and France specify a minimum of 1,5 mm sq .

5.0 PROTECTION

5.1 **Great Britain**

Re-wireable fuses are still used extensively in Britain while HRC fuses and miniature circuit breakers are used to a lesser extent. Sensitive earth leakage protection is not mandatory and appears to be little used.

5.2 **Germany**

In terms of V.D.E. regulations cartridge type fuses or miniature circuit breakers may be used for over-current protection in domestic installations and earth leakage protection is only mandatory in certain hazardous locations, such as hospitals or where there is a fire hazard. It was interesting to note that in Germany the regulations provide for the installation of a foundation earth in the form of a galvanised strip laid in the foundation of the building which is terminated at the point of connection to the supplier's service main. In Germany three phase domestic installations are common.

5.3 **France**

Earth leakage protection at 500 milli-amps is mandatory and it was acknowledged that this was a compromise to avoid nuisance tripping and was of little value as protection to human beings against electric shock. Fuses are still very much in use in France. In earth free situations e.g. carpeted floors, no earth is provided on socket outlet circuits.

5.4 **Portugal**

Miniature circuit breakers are mandatory for domestic installations. Low sensitivity (250 — 500 milli-amps) earth leakage protection is used on socket outlets and lighting circuits in certain cases where high earth resistance values are encountered. Sensitive (30 milli-amp) protection is frequently specified by the designer of the installation on individual circuits where portable appliances are likely to be used.

6.0 ACCESSORIES

6.1 Use is made of 75 mm X 75 mm metal and plastic boxes, some being only plaster depth, for switches and socket outlets and circular boxes with 50 mm fixing centres for lighting points. A variety of fixing arrangements and knock-outs for entry of the conduit or cable is manufactued to suit the circular and oval conduit and multi-bore conduit. Switches, socket outlets and lighting fittings are manufactured in S.A. at present to suit some of the boxes used in the U.K. The I.E.E. wiring regulations permit only metal boxes in concrete.

6.2 **Germany**

6.2.1 Circular plastic boxes with an internal taper are mainly used for switches, socket outlets and lighting points. The box will accommodate only one socket outlet (unswitched) but several boxes may be fitted together to accommodate multiple socket outlets or switches. No special provision is made for fixing cables at the point of entry to the boxes as these are fastened to the wall and sealed with gypsum plaster at the point of entry to the box.

6.2.2 Switches and socket outlets manufactured in South Africa are not suitable for fitting to the standard German box but there is no reason why the standard 2 x 4 or 4 x 4 plastic boxes manufactured in S.A. could not be used with the German cabling systems, together with the associated South African accessories.

6.2.3. The German and French design of switches and socket outlets and the fixing arrangements of accessories in the boxes have certain advantages over the South African design and offer potential savings, in installation time and use of materials.

6.3 **France**

Switches, socket outlets and other accessories manufactured in France appear to be virtually the same as the German types and a variety of plastic boxes is manufactured specifically to suit the flexible conduit system and the building construction methods used in France.

6.4 **Portugal**

Wiring materials and accessories follow International Electrotechnical Commission (I.E.C.) speciications or local Portuguese specifications when available. It was stated that the expanding claw-type of fixing of switches and socket outlets in boxes which is used in Germany is not favoured in Portugal due to the possibilities of the fitting pulling out of smooth parallel walled boxes. Screwless connectors on accessories are permitted.

7.0 ELECTRICAL CONTRACTORS, APPLICATION OF STANDARDS AND INSPECTION OF WIRING WORK.

7.1 **Great Britain**

7.1.1 The electrical installation contracting industry is not governed by Act of Parliament as is the case in S.A. in terms of the Electrical Wiremen and Contractors Act but a system by which the industry is self-regulating in the form of the National Inspection Council for Electrical Installation Contracting (N.I.C.E.I.C.) has been in operation for more than twenty years. This is a consumer protection organisation to protect the public against faulty or unsafe electrical installations.

7.1.2 The Council achieves its aim by maintaining a Roll of Approved Contractors (± 8 000 strong) and by ensuring that all those whose names appear on that roll shall at all times carry out their work with materials of good quality, installed by competent electricians, adequately supervised. The standard required of an approved contractor is conformity with the current edition of the "Regulations for the Electrical Equipment of Buildings" compiled and published by the Institution of Electrical Engineers (I.E.E.).

7.1.3 All contractors accepted for enrolment must sign a written undertaking that their work will conform to this standard, and a very thorough inspection is made of their business premises, equip-

ment and actual installation work by N.I.C.E.C. Inspecting Engineers. After enrolment they are still subjected to periodical inspection to see that they maintain the necessary standard of workmanship, in the interests of the safety of electrical consumers. Funding is by grants from the Electricity Council, Electricity Boards and registration and subscription fees.

7.1.4 Council consists of representatives of a surprisingly large number of bodies. Council draws up the rules which are applicable to the industry and the powers of Council under these rules are vested in the National Inspection Board. Council employs ± twenty-four inspecting engineers spread across the country. The National Inspection Council also provides a technical information service to the public, instructors, students and others engaged in educational work. The Council enjoys the support of the Electrical Contractor's Associations for England and Scotland but the Roll of Approved Contractors contains many names of contractors who are not members of these associations.

7.1.5 An important person in the organisation is the "Qualifying Manager" who is a person who has been an approved Electrical Installation Contractor on the roll of Council or has acted as manager, Supervisor or Foreman of electrical installation work for a period of not less than three consecutive years and is directly responsible for the work undertaken by the contractor by whom he is employed on a full-time bases, and whose name and qualifications have been notified to, and accepted by the Council. This "Qualifying Manager" closely resembles the "Responsible Person" in the Factories, Machinery and Building work Act should the present legislation with respect to wiring work ever become part of this Act.

7.1.6 The approved contractors whose names appear on the roll are required to issue a completion certificate for every job they do and also provide an inspection certificate when they have carried out an inspection and test of an installation, or part of an installation. The certificate issued are those that are requirements of the I.E.E. Regulations before the electricity supply is made available.

7.1.7 Electricians are not registered but complete a prescribed apprenticeship as determined by the Electrical Contracting Industry. The N.I.C.E.I.C. Inspection Engineers have qualifications which lead to corporate membership of the I.E.E. and a minimum of five years supervisory experience is required.

7.1.8. It would therefore seem that a similar organisation to the N.I.C.E.I.C. could be created in S.A. with the Electrical Contractors' Association (E.C.A.) and the Association of Municipal Electrical Undertakings (AMEU) being the main participants. Such an organisation could operate side by side with the present legislation and at this stage provide a common basis for registration of contractors in terms of the Electrical Wiremen and Contractors Act. Collectively, the present cost of individual registration and the administrative load on suppliers and contractors would possibly pay for such a body. Should wiring work regulations be absorbed under the Factories. Machinery and Building Work Act as has been advocated by some, then this type of organisation with its cheeks and contols would fit in well in the scheme of things. Present legislation places an unnecessarily heavy financial burden upon Government, (Central and Local) and the Electrical Contracting Industry.

7.2 **Germany**

7.2.1 All wiring work is carried out under the supervision of qualified Electricians (Meister Elektro-Installateur) in accordance with V.D.E.W. (Vereniging Deutscher Elektrisitätswerke) supply regulations and V.D.E. specifications which however, are not mandatory but accepted as a code of practice as in the U.K.

7.2.2 The electrical contractors are registered by the Electricity Supply Authorities (E.V.U.). There are 1 600 Electricity Supply Authorities in West Germany and these suppliers only undertake random inspections of wiring installations as it remains the responsibility of the electrical contractor to test and hand over the wiring work in compliance with V.D.E.W. supply regulations on a similar basis to that in the U.K. The Electricians (Wiremen) as such are however not registered after completion of apprenticeship as determined by the Building Industry.

7.2.3 In accordance with the V.D.E.W. regulations the electrical contractor has to fill in commencement certificates and obtain permission from the E.V.U. before any work is commenced. The following types of wiring work need notification:

1. All new electrical installations.
2. Temporary installations.
3. Extensions/Alterations requiring supply, metering or tariff changes.
4. Installation of fixed electrical equipment (not electrical equipment normally fed from a socket outlet).
5. Changing of fixed electrical equipment if it affects the supply, metering or tariff.
6. Standby generation equipment.

7.2.4 The Supply Authority can request the electrical contractor to be present when a new electrical installation has to be energised. However it remains the electrical contractor's function to commission the electrical installation on behalf of the client for which he accepts the legal responsibility and for which he has to submit a prescribed completion certificate.

7.3 **France**

7.3.1 Conditions are similar to those in West Germany, except that the French Wiring Regulations are mandatory.

7.3.2 Electricians (Wiremen) complete an apprenticeship as prescribed by the Electrical Industry (F.N.E.E.).

7.4 **Portugal**

Conditions are similar to those in Germany and France except that a Wireman apprenticeship is not indentured and merely learns by experience (± 3 years) whereafter he becomes an Electrical Installer.

8.0 ACCIDENT STATISTICS

8.1 **United Kingdom**

It was stated that four to five thousand accidents occur in homes in the U.K. per annum, of which approximately 1 percent, say 50 per annum, are due to electrical causes. Most of these occur on appliances. An opinion was expressed that this accident frequency does not justify earth leakage protection. While no firm evidence was available it was felt by certain of the representatives interviewed that a considerable number of fires in the U.K. resulted from wiring faults and that the rate was increasing.

8.2 **Germany**

It was stated that approximately 300 fatal accidents occur per annum in Germany of which approximately 80 occur in domestic premises and most of these are due to misuse of appliances. Approximately 10 fatalities per annum are due to lightning and the balance of accident fatalities are said to be divided approximately equally between industrial accidents and power supply company accidents.

8.3 **France**

No accident statistics were available from the sources interviewed.

8.4 **Portugal**

It was stated that approximately 50 electrocutions occur each year in Portugal but no division between domestic and other premises was available.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 The tour provided a valuable opportunity for discussion with manufacturers, installers and users of electrical wiring systems as well as representatives of authorities responsible for the preparation and administration of wiring rules and regulations and the inspection and testing of installations. The practices in the countries visited differ radically from S.A. practices in some respects and it is considered that this investigation and assessment by representatives of the bodies responsible for the installation, testing and approval of wiring work and the government Department controlling the registration of electrical wiremen and the wiring regulations in S.A. was justified and necessary before any major change was introduced to the system presently used in this country.

9.2 There is no doubt that the present system of wiring in domestic type buildings in S.A. employing rigid plastic or screwed steel conduit represents a high standard of installation in terms of safety, durability and flexibility. The system has largely been superseded in Europe by alternatives previously referred to due to the economies in material and labour which they produce.

9.3 On the evidence of discussions and inspections carried out during the tour, it appears that all systems in use in the U.K., Ger-

many, France and Portugal have proved satisfactory in their particular environments and circumstances. The delegation is therefore in unanimous agreement in principle, subject to acceptable standards of workmanship being maintained, with the conclusion reached by Messrs. van Staaten and Sage, as set out in section 5.1 (Page 8) of their report to the effect that there appears to be no reason why the use of all the systems described in this report can, with certain provision, not be permitted in this country.

9.4 It is accordingly recommended that the body responsible for the approval of new electrical commodities and techniques in S.A. obtain, examine and edit the rules for installation specified in the relevant national wiring regulations and by the manufacturers of the following wiring systems in use in Great Britain, Germany, France and other European countries.

(a) Flat twin and earth PVC insulated and sheathed armoured and unarmoured cables (U.K.)
(b) Multi-bore conduit (U.K.)
(c) Under plaster flat cables (Germany)
(d) Circular PVC insulated and sheathed unarmoured cables (Germany)
(e) Flexible conduit systems (France)

and that these systems be authorised for use subject to compliance with such rules amended as necessary to cater for any special conditions of installation or use in S.A.

9.5 In view of the information obtained relating to electrical accidents and the opinions expressed by the majority of those interviewed that the greatest hazard in domestic type installations is with appliances rather than the fixed wiring, it is considered unnecessary to impose any additional earth leakage protection requirements with the introduction of these new wiring systems into S.A. The delegation therefore unanimously recommends accordingly.

9.6 In view of the advantage of solid conductors for wiring cables in certain circumstances it is recommended that these be permitted up to 2,5 mm² and that the South African wiring regulations be amended accordingly.

9.7 There appears to be no reason wny British and European practice in relation to earth wires used in the electrical installation of buildings should not be followed. The delegation therefore recommends unanimously that the South African wiring regulations be amended to provide for the lowering of the present minimum size of earth continuity conductor from 2,5 mm² to 1,5 mm².

9.8 While it is not directly relevant to the authorisation of new wiring systems, it will be noted from section 7 of this report that useful information was obtained concerning the training and registration of electrical wiremen and inspection and testing of electrical installations and the delegation is of the opinion that legislation and practices in this country in this regard should be re-examined in the light of the procedures in use in Britain, Germany and France.

9.9 The delegation wishes to place on record its appreciation of the assistance rendered by the various individuals and organisations referred to in this report and the contributions of the National Development Fund, the National Building Research Institute of the C.S.I.R., the Department of Labour, the Electrical Contractors' Association of S.A., the Association of Municipal Electricity Undertakings of S.A. and the City Councils of Springs and Durban.

MR. J. K. VON AHLFTEN, Springs:

Mr. President, may I, on behalf of Dennis Fraser and myself, as the AMEU delegates on the study tour, first of all thank the AMEU Executive Council for the opportunity to have taken part in this investigation, which I am sure will have far reaching implications on the wiring methods presently in use in this country with considerable economic advantages.

It was quite obvious that many of these innovative wiring systems in use overseas could be applied successfully in South Africa, especially when it comes to large economic housing projects for which there is an enormous demand at present. It is, therefore, gratifying to report that the AMEU Executive Council, as the responsible body representing the suppliers of electricity in South Africa, has been completely objective in the assessment of these new wiring systems which will give the local manufacturing and electrical contracting industry an opportunity to prove itself in this respect.

The AMEU Recommendations Committee as well as Working Group 4 of the Wiring Code Main Committee have therefore been entrusted with the task to evaluate these systems and it would be interesting to have a brief report on the progress made so far.

Mr. President, I would, therefore, wish to call upon Mr. Loubser of the Recommendations Committee as well as upon the representative of the SABS to inform the Convention on the progress in this respect.

Regarding the re-examination of legislation and practices in this country concerning the registration of electrical wiremen and contractors and the inspection and testing of electrical installations, an AMEU Sub-Committee has been set up by the Executive Council in consultation with the ECA, ESCOM, E.C.E.A. and the Department of Labour to investigate this whole matter. I may mention that the first meeting was held on 14 February 1979 and that a progress report will be submitted to the Executive Council in due course. This is a very important aspect which concerns us directly as present legislation places a heavy financial burden upon suppliers and the electrical contracting industry as a whole. By way of comparison the N.I.C.E.I.C. in the U.K. has an annual budget of R0,75 m for the control of wiring work to protect the public against faulty or unsafe electrical installations, whereas a conservative estimate would indicate that the cost for the control of wiring work by suppliers in the R.S.A. could be in the region of R5 m per annum.

This is an aspect which, therefore, needs a thorough analysis with the reservation, of course, that the present safety standards of wiring work in South Africa be not lowered to an unacceptable level keeping in mind our heterogeneous population.

Finally, Mr. President, the excellent report on the study tour which you have in front of you was prepared in its final format by Dennis Fraser and I wish to thank him on your behalf for his valuable assistance in these investigations. I also wish to thank the B.I.F.S.A. and the ECA as well as Mr. Weich of the Department of Labour for their financial and personal assistance. I must also record our thanks to the Director of the NBRI for all the arrangements the NBRI made overseas to make the study tour possible.

MR. P. J. BOTES, President:

Thank you Mr. von Ahlften, and you Mr. Fraser, for compiling such a very good report.

MR. M. D. SAGE, N.B.R.I.:

The electrical installation industry is about to follow a trend away from steel towards PVC. At present most conduit, boxes, accessories and switchboards are made of steel. In the future PVC conduit, PVC sheathed cables and plastic boxes, accessories and switchboards will replace steel installations.

Plastic conduit and non-metallic sheathed cables, on the surface and concealed, will be accepted in the same way as in Europe.

The advantage of the noval wiring systems is the reduction of site labour. These systems are light and easy to install and lend themselves to prefabrication. Electrical contractors must be willing to pass on their savings to their clients.

Legislation accepting the novel wiring systems is only the beginning.

1. Specifiers, government departments and consulting engineers should allow these systems where they have application, for instance in housing.
2. Manufacturers should co-operate to provide complete wiring systems. Plastic boxes, accessories and switchboards are more compatible with the novel wiring and should be preferred to steel.
3. Wiremen need training in the use of the novel systems and the trade test should include these systems.

In conclusion, the cost savings of the novel wiring systems may be put to good use by providing more socket outlets in the home. A typical South African house with 3 bedrooms may have ten socket outlets. For a similar British house, 15 to 20 socket outlets were recommended in 1961, and 28 double socket outlets in 1977.

On behalf of the National Building Research Institute, I thank the AMEU for the assistance they have given us, and for the initiative they showed by taking part in the recent overseas tour.

In particular, I wish to thank Mr. Jules von Ahlften and Mr. Dennis Fraser for their participation in the overseas tour and for the work they put into the comprehensive report.

MR. W. BARNARD, Johannesburg:

Mr. President, under this item I would like to make just one very quick point.

I would like to draw your attention to the item under "Earthing", where it is stated that the Bureau of Standards will shortly be issueing a Code of Practice.

The AMEU Executive has established a Committee to look at earthing

of distribution systems, and I can report at this stage that we, in Johannesburg, are presently doing an indepth study into this subject, and we will shortly be circulating our current findings to all the branches for comment, and then it is hoped, we will get together for discussions.

The establishment of the AMEU Committee was initiated, as you will remember, by a number of Municipalities who had problems with the Department of Labour over various aspects of earthing, such as earthing every fourth pole. Quite candidly I did'nt even know whether it was a steel pole of a wooden pole and, at this stage, we do not know why every fourth pole, or why every pole, or why no poles should be earthed.

However, as I have already said, we are examining this matter in Johannesburg and we will send to all the branches copies of our preliminary report on our findings. Then we can get together and it is hoped, finally solve these vexing problems of multiple earthed neutrals, P.M.E. systems and earthing of poles, etc.

Thank you.

DR. ANDERSON, C.S.I.R.:

Mr. President, Ladies and Gentlemen — I would like to amplify some of the points which Mr. Barnard mentioned in his report.

Under the High Voltage Co-ordinating Committee, which he mentions, and on which the AMEU is represented, there are two Task Forces.

One on lightning flash counters which, as mentioned in the report, has the job of making the measurements of lightning throughout the Republic. This data is sent monthly to the C.S.I.R. where it is processed and the findings is made known to those people who are operating the counters. There should be counters in practically all major centres throughout the Republic, and if any of you wish to know where the nearest counter to your area is, please contact the C.S.I.R., and we will give you the location together with information on the identity of the operator. We are grateful to the AMEU for those of its members who are operating counters for the National Scheme.

The position to date is that we have a three-year average lightning flash density map of the Republic. Copies of this can be made available to members.

The other Task Force deals with the lightning protection of distribution lines. It's headed by Mr. Penmann of Escom and comprises representatives of the AMEU, ourselves and various other interested parties.

Among the main aspects that this Task Force is dealing with, is the question of failure of surge arrestors and transformers, and also the question, mentioned a moment ago, about the most suitable forms of 11kV construction to achieve the best results as far as lightning performance goes. So these matters are very much of interest to you and your Representative on that Committee, I am sure, will report on its findings from time to time.

An essential requirement is information and if any Municipality does keep records of failures of equipment and lightning performance of lines, these will be very gratefully received by this Task Force to assist in comparing the operation of various types constructions, throughout the Country.

The second point Mr. President, is just to mention again on the theme of 11kV distribution lines — the unique experiment which has been started with a 10 km length of line built by Escom, on which Escom and the C.S.I.R. are making measurements of the voltages which are induced by lightning. We have already had one season of operation and much data results has been obtained. This has not yet been processed, but it will give us direct information as to what is happening on an 11 kV system for as a result of lightning strokes either direct or nearby, and we will in fact also be measuring the distances lightning strikes away from the line, and what voltages are involved.

This information will be gathered over a period of about five years. The line has got no consumers on it and one might say it is a B.S. 1320 type of standard construction that Escom uses with no earthwire at present, but provision has been made to add one at a later date, and further measurements will then be made.

I thought Mr. President, your Association would like to have this information, and I would be only too pleased to answer questions on this subject if anybody should have any.

Thank you.

NATALSE STREEKVELDKOMITEE INSAKE ELEKTROLITIESE KORROSIE: VERSLAG VIR 1977/1978

Hieronder volg my verslag oor bg. Komitee se werksaamhede gedurende die tydperk 1977 tot 1978.

Die Natalse Hoof- Streekkomitee bestaan uit verteenwoordigers van die volgende instansies:

S.A. Spoorwegadministrasie.
V.M.E.O.
Evkom.
Departement van Waterwese
S.A. Steenkool- en Gaskorporasie.
Korrosiebeheergroep van die Olienywerhede.
SASOL.
Hoofposkantoor.
A.E. & C.I.

Die huidige ampsdraers is:

Voorsitter: mnr. M. L. Whitehead : S.A. Spoorweë
Chairman: Mr. M. L. Whitehead. : S.A. Railways

Ondervoorsitter: mnr. D. H. Fraser : V.M.E.O.
Deputy Chairman: Mr. D. H. Fraser : A.M.E.U.

Vier vergaderings is gedurende die pasverstreke tydperk van twee jaar gehou. Al die betrokke instansies het baat gevind by die bespreking van aangeleenthede betreffende korrosie tydens hierdie vergaderings. Punte van bespreking was onder meer:

(a) Die pynlyn gelê deur die Departement van Waterwese.

(b) Die gebruikskode ten opsigte van die katodiese beskerming van ondergrondse strukture.

(c) Die korrosie van die koaksiale kabel van die H.P.K. te Westville.

(d) Die korrosie van 'n kabel van die H.P.K. te Malvern.

(e) Die korrosie van 'n kabel van die H.P.K. te Montclair en omstreke.

(f) Pietermaritzburg — korrosie van kabels en gegalvaniseerde waterpype.

THE NATAL ELECTROLYTIC CORROSION REGIONAL FIELD COMMITTEE: REPORT FOR 1977/1978

I set out below my report on the activities of the above Committee during the period 1977 to 1978.

The Natal Regional Field Committee comprises representatives of the following organisations:

S.A. Railways Administration.
A.M.E.U.
Escom.
Department of Water Affairs.
S.A. Coal and Gas Corporation.
Oil Industries Corrosion Control Group.
SASOL.
General Post Office.
A.E. & C.I.

The present office bearers are:

Chairman: Mr. M. L. Whitehead. : S.A. Railways

Deputy Chairman: Mr. D. H. Fraser : A.M.E.U.

Four meetings were held during the two year period, at which matters relating to corrosion were discussed to mutual advantage. Amongst these were:

(a) Department of Water Affairs pipeline.

(b) Code of Practice for Cathodic Protection of Buried Structures.

(c) Corrosion of G.P.O. co-axial cable — Westville.

(d) Corrosion of G.P.O. cable — Malvern.

(e) Corrosion of G.P.O. cable — Montclair area.

(f) Pietermaritzburg — Corrosion of cables and galvanised water pipes.

(g) Die korrosie van die aardmat by die Skume-substasie te Vryheid.

(h) Die swerfstroom te Tweediestasie.

(i) Elektroliese: traksiesubstasie by Alverstone.

Belanghebbende instansies het die aangeleentheid die afgelope twee jaar by verskeie geleenthede breedvoerig in oënskou geneem. 'n Interessante feit wat aan die lig gekom het, is dat 70% van die gevalle van korrosie waarvan verslag aan die Natalse Komitee gedoen is, betrekking het op kabels van die H.P.K. en beskadigde huishoudelike waterpype.

Dit blyk uit die notules van die vergaderings van ander steekkomitees insake korrosie dat die noukeurige byhou van registers van ondergrondse strukture soos pyplyne en kabelnette so belangrik geag word dat daar begin is met 'n gerekenariseerde kartografiestelsel ten opsigte waarvan die WNNR as rigsnoer gedien het. Die projek moes ongelukkig vanweë 'n gebrek aan fondse gestaak word. Na verneem word, het Kaapstad voortgegaan met die daarstelling van 'n gerekenariseerde kartografiestelsel en belangstellendes kan nadere besonderhede van die betrokke instansie aldaar verkry. Die Stadsingenieursdepartement van Durban het begin om nuwe sketse te maak van die pypnetstelsels in die stad. Metrieke afmetings word gebruik en al die katodiese beskermingspunte word op die sketse aangetoon.

In die notules van die vergaderings van die Wes-Kaapse Komitee word daar telkens melding gemaak van die riooluitloop te Mouille Point, Kaapstad. Dit dien ook vermeld te word dat daar 'n paar maande gelede ondersoek ingestel is na die doeltreffendheid van die twee hoofafvoerriole wat in die see by Durban uitloop. 'n Projek is van stapel laat loop waarin omvattende toetse gedoen is om vas te stel hoedanig die prestasie van die aardingsbeddings van die opgelegde stroom is en om data in te win wat van nut sal wees ten opsigte van katodiese beskerming in die algemeen. Die Stadselektrisiteitsdepartement van Durban het 'n uitvoerige verslag oor die projek opgestel.

Probleme word nog steeds ondervind met die korrosie van huishoudelike waterpype vanweë oordrag van swertgelykstrome via die aardverbinding wat deur die lektrisiteitsvoorsiener verskaf word en deel van die kragnet uitmaak.

Wat die saak nog verder bemoeilik, is die feit dat daar in toenemende mate van nie-metaalagtige pype gebruik gemaak word vir hoofwaterleidings en dat kort lengtes plastiese pyp ook soms aan verbruikersleidings gekoppel word. Daar is voorgestel dat die aarding van verbruikersinstallasies in heroorweging geneem moet word en dat voorsiening daarvoor gemaak moet word in die bedradingsregulasies. Die Chemiese en Korrosie-institute van die Universiteit van die Witwatersrand het op 26 en 27 Julie 1977 'n korrosieskool aangebied en die referate wat gelewer is, is in boekvorm saamgebind. Eksemplare daarvan kan teen R10 stuk aangeskaf word.

Die aardingsbed van die Apollo-sub-stasie van EVKOM is te berde gebring onder die besprekingspunt Algemeen en dit blyk dat die probleme wat ontstaan het as gevolg van die Cabora Bassa-enkelpolige transmissiestelsel, nog steeds voorkom.

Daar kan verwag word dat heelparty probleme met korrosie ondervind gaan word by Vryheid, waar die nie-geaarde G.S.-spoorstelsel aansluit by die geaarde spoor van die W.S.-trekkrag-stelsel. Die S.A.S. doen tans toetse daar en hul bevindings sal na alle waarskynlikheid op 'n latere vergadering van die Natalse Streekveldkomitee bespreek word.

Mnr. Stafford het gedurende 1978 uit die diens van die S.A.S. getree en is as voorsitter van die komitee opgevolg deur mnr. M. L. Whitehead.

Ek is daarvan oortuig dat die VMEO steeds baat vind by sy verteenwoordiging op hierdie Komitee. Die Natalse VMEO-tak word op hoogte gehou aangaande die verrigtinge van die Komitee, deurdat die notules van die halfjaarlikse vergaderings van hierdie Komitee steeds onder die lede van genoemde tak versprei word.

Die nuwe gebruikskode vir die katodiese beskerming van ondergrondse strukture staan nou bekend as SABS 0121 — 1977.

(g) Corrosion of Earthmat at Skume Substation — Vryheid.

(h) Stray Current at Tweedie Station.

(i) Electrolysis: Alverstone Traction Substation.

A considerable amount of useful discussion between interested parties has taken place during the past two years and it is interesting to note that approximately 70% of the corrosion reports received by the Natal Committee concern the G.P.O. and damage to domestic water pipes.

From consideration of the minutes of other Regional Corrosion Committees it was noted that the importance of maintaining accurate records of buried structures such as pipelines and cable networks prompted the development of a computerised Carography system which was being guided by the C.S.I.R. Unfortunately, due to lack of funds, this project has been abandoned. It has been indicated that Cape Town has gone ahead with Computerised Cartography and interested parties are invited to approach them for further information. The Durban City Engineer's Department has embarked on a project aimed at redrawing all its pipe work layouts to confirm to metric standards and to show all cathodic protection points.

The Cape Town Mouill Point sewerage outfall has featured regularly in the Cape Western Committee Minutes and it may be of interest to record that a survey of the two Durban effluent sea outfalls was completed a few months ago, and a comprehensive test project was undertaken to determine the performance of the impressed current earth beds as well as to gather data of technical value to cathodic protection generally. A detailed report dealing with the project has been prepared by the Durban Electricity Department.

Corrosion of domestic water pipes due to the transfer of stray direct current, via. the earth connection from the electricity supply mains, where this is provided by the supply authority, remains a problem still to be solved.

The problem is aggravated by the increasing use of non-metallic water mains and the introduction of short lengths of plastic piping sometimes inserted in the service water main. It has been suggested that the subject of consumer installation earthing be reviewed and included in detail in the wiring regulations. It was reported that a Corrosion School was run by the Chemical and Corrosion Institutes of the University of the Witwatersrand on the 26th and 27th July, 1977 and copies of the papers which were presented are obtainable in book form at about R10 per copy.

The subject of the ESCOM Apollo Sub-station earth bed was raised in general discussion and it appears that problems resulting from monopolar operation of the Cabora Bassa Transmission system still exist.

A new area which promises to raise some interesting corrosion problems in Vryheid, where the unearthed track D.C. system meets the earthed track A.C. traction system. The S.A.R. are carrying out tests in this area and it is expected that their findings will be discussed at future meetings of the Natal Committee.

The Chairmanship of the Committee changed during 1978, with the retirement of Mr. Stafford from the service of the S.A.R. He was succeeded by Mr. M. L. Whitehead.

I am satisfied the AMEU representation on this body continued to be beneficial and members of the Natal Branch have been kept informed of the activities of the Committee through circulation of the Minutes of the bi-annual meetings.

The new Code of Practice for the Cathodic Protection of Buried Structures is now SABS 0121 — 1977.

D. H. FRASER
VERTEENWOORDIGER/REPRESENTATIVE

VERSLAG OOR WERKSAAMHEDE 1977/78 WITWATERSRANDSE STREEKSKOMITEE INSAKE ELEKTROLITIESE KORROSIE

Die Witwatersrandse Komitee het vier keer gedurende 1977 en 1978 vergader. Onder die roetine sake wat bespreek is, was versoeke vir dreineringsverbindings en versonke stroomafvoerstelsels, kennisgewings

REPORT OF WITWATERSRAND ELECTROLYTIC CORROSION REGIONAL FIELD COMMITTEE 1977/78

The Committee met four times during 1977/78. Among the routine matters discussed, were requests for drainage bonds and impressed current systems, advices of services crossing under railway lines and

van diensleidings wat onder spoorlyne deurloop en klagtes oor korrosie van ondergrondse diensleidings. 'n Maandelikse nuusbrief met besonderhede van veranderings wat die diensleidings raak is gesirkuleer.

APOLLO-SUBKOMITEE

Die spesiale subkomitee wat aangewys is om die uitwerking van die aardelektrode van die Cabora Bassa GS transmissie lyn op nabygeleë diensleidings te bepaal, het 'n aantal ondersoeke in die verslag tydperk afgehandel. Die ekwipotensiaallyne wat in die gebied ontstaan as die maksimumstroom van 3 300 ampere deur die aard elektrode vloei, is op 'n kaart aangeteken. Die komitee het aanbeveel dat geen ondergrondse diensleidings in die gebied waar die potensiaalgradiënt 30 V/km oorskry toegelaat word en dat spesiale beskermingsmaatreëls vir alle metaalstrukture in die gebied waar die gradiënt tussen 30 V/km en 40 V/km lê, getref word. Die gebied strek tot ongeveer 15 km vanaf die aardelektrode.

SWERFSTROME OP AARDDRADE

Die saak is na die Standaarde Buro verwys vir oorweging saam met die hersiene regulasies vir die bedrading van persele.

KORROSIE VAN AARDMATTE BY WS TREKKRAGSUBSTASIES

Evkom het probleme ondervind as gevolg van die deurslaan van die vonkgapings wat die WS en GS aardmatte by substasies skei. 'n Verbeterde vonkgaping is gebruik in 'n poging om die probleem te bowe te kom. Korrosie het ook voorgekom op WS trekkrag stelsels en veral by die plekke waar die oorskakeling tussen WS en GS trekkrag plaasvind. Die saak word verder ondersoek.

SUID-AFRIKAANSE HOOFKOMITEE INSAKE ELEKTROLITIESE KORROSIE

Die hoofkomitee het gedurende September 1977 en September 1978 vergader.

Verslae van die streekskomitees vir die Witwatersrand, Wes Ko-op, Noord-Kaap en Natal dui daarop dat hierdie komitees daarin slaag om plaaslike pogings om elektrolitiese korrosie tee te werk te koördineer.

Die gebruikskode vir "Die Katodiese Beskerming van Ondergrondse Strukture" (SABS 0121-1977) is goedgekeur en beskikbaar gestel. Die gebruikskode bevat ook bepalings rakende kabels en pypleidings wat onder spoorlyne deurloop.

Evkom het veranderings aan die Apollo aardstelsel vir die Cabora Bassa GS transmissielyn aangebring en die eienaars van diensleidings in die omgewing het ook stappe gedoen om korrosie probleme wat ontstaan as gevolg van die stroom wat deur die aardelektrode vloei te verlig. Die ondervinding wat tot dusver opgedoen is, is redelik bevredigend en die ongebalanseerde werkingstyd was gering.

complaints of corrosion of buried services. A monthly newsletter was circulated giving information on changes affecting these services.

APOLLO SUBCOMMITTEE

The special subcommittee appointed to investigate the effects on surrounding services of the earth electrode for the Cabora Bassa DC link at Apollo carried out a number of investigations during the period. These resulted in a map showing equipotential lines in the area for electrode operation at 3 300 amps, the design maximum. The recommendation of the committee was that no buried services be allowed in the area where the potential gradient exceeds 30 V/km and that special protective measures be taken for metallic structures where the gradient lies between 30 V/km and 40 V/km. This area extends approximately 15 km radius from the electrode.

STRAY CURRENTS ON EARTH WIRES

This matter was passed to the Bureau of Standards for consideration in the revised regulations for the wiring of premises.

CORROSION OF EARTH MATS AT AC TRACTION SUBSTATIONS

Difficulties were being experienced by Escom because of breakdowns in the spark gaps separating the AC and DC earth systems at substations. An improved type of spark gap was installed to overcome the problem. Difficulties were also being experienced from corrosion on the AC traction systems, principally at change-over points between AC and DC traction. This watter was being investigated.

REPORT OF MAIN S.A. ELECTROLYTIC CORROSION COMMITTEE 1977/78

Meetings of the Main Committee were held in September 1977 and September 1978.

Reports from the Regional Committees for Witwatersrand, Cape Western, Cape Northern and Natal Committees indicated that these committees were effective in co-ordinating local efforts to combat electrolytic corrosion.

The code of practice for "The Cathodic Protection of Buried Structures" has been approved and issued by the SABS (SABS 0121-1977). This code also incorporates the requirements for cables and pipelines crossing beneath railways tracks.

Escom has made modifications to the earthing system at Apollo for the Cabora Bassa DC link and owners of services in the vicinity have also taken steps to alleviate corrosion problems arising from earth turrents from this electrode. Operating experience this far has been reasonably satisfactory, with unbalanced operation of the link being relatively infrequent.

W. BARNARD
VERTEENWOORDIGER/REPRESENTATIVE

WES-KAAPLANDSE STREEKSKOMITEE INSAKE ELEKTROLITIESE VERWERING. VERSLAG OOR WERKSAAMHEDE — 1977/1978

Ses vergaderings van die Wes-Kaaplandse Streekskomitee insake Elektrolitiese Verwering is gedurende die periode onder oorsig gehou, onder die bekwame voorsitterskap van mnr. R.E. Gilmour van die Munisipa-liteit Kaapstad.

Vergaderings is goed deur Komiteelede, wat die volgende organisasies verteenwoordig, bygewoon:

S.A. Spoorweg-Administrasie.
Die Stadsraad van Kaapstad.
EVKOM
Afdeling Pos en Telekommunikasiewese.
Die Verweringsbeheergroep van die Olienywerheid.
Cape Gas Beperk.
Die Kaapse Provinsiale Administrasie.
Die Stadsraad van Kaapstad Ingenieursafdeling (Chemiese Tak).
Die Vereniging van Munisipale Elektrisiteitsondernemings.

Roetine toetse is op ondergrondse dienste in die gebied uitgevoer en

CAPE WESTERN ELECTROLYTIC CORROSION REGIONAL FIELD COMMITTEE. REPORT ON ACTIVITIES — 1977/1978

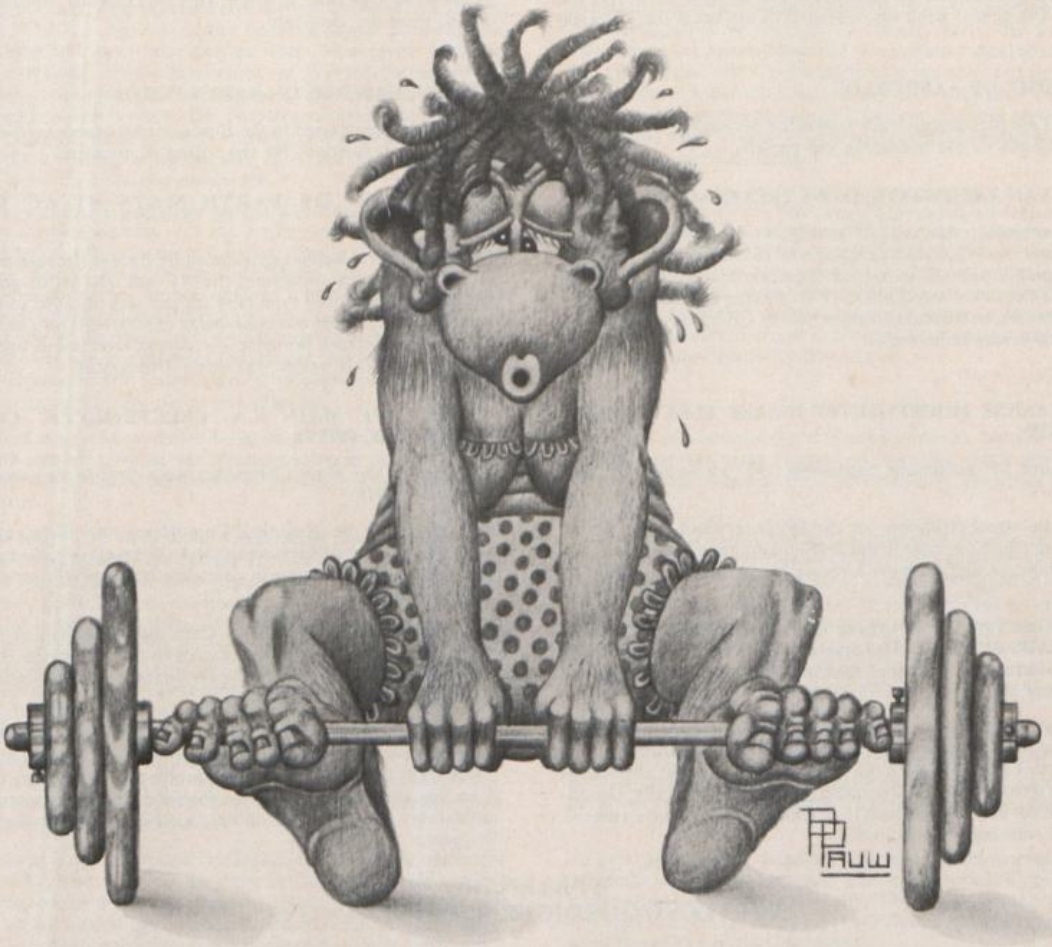
Six meetings of the Cape Western Electrolytic Corrosion Committee were held during the period under review under the able chairmanship of Mr. R. E. Gilmour of the Cape Town Municipality.

Meetings were well attended by members of the Committee representing the following organisations:

S.A. Railways Administration,
Cape Town City Council.
ESCOM.
Department of Post and Telecommunications.
Oil Industry Corrosion Control Group.
Cape Gas Ltd.
Cape Provincial Administration.
Cape Town City Engineer's Department (Chemical Branch).
The Association of Municipal Electricity Undertakings.

Routine tests of underground services in the area were carried out and

Take the load off your transformers



We can reduce your Transformer Failures.

We have fully mobile laboratories and purification plants, manned by highly qualified technicians to test and purify your transformer oils *on site and on load.*

We use our successful heat and vacuum purification process to remove air, gas, sludge, sediment, solids, water and moisture from transformer oils.

We will save you oil purchases, transportation, oil dumping and expensive down time.

We can extend transformer and switchgear life and increase plant efficiency.

We also supply Breathers and silica gel.

Call Chemilite to test and purify your transformer oils.

CHEMILITE

CITY	ADDRESS	P.O. BOX	TEL.	TELEX
Johannesburg	14 Sandberg Street, Denver	25720 Denver 2027	(011) 616-1313	8-6955 S.A.
Bulawayo	7 Bellevue Road, Belmont	6107 Morningside	(01919) 7-0098	3385 R.H.
Cape Town	30 Selsdon Road, Tiervlei	130 Eppindust 7475	(021) 93-2197	57-6326 S.A.
Durban	Factory 1, 7 Schenk Road, Pinetown	342 Pinetown 3600	(031) 71-1347	6-5102 S.A.
Middelburg, Tvl.	2, 5th Street, Middelburg	177 Middelburg 1050	(01321) 4979	—
Port Elizabeth	143 Commercial Road, Sidwell	14042 Port Elizabeth 6061	(041) 41-3304	74-7974 S.A.
United States of America	506 Rosamond, Houston, Texas, 77076	—	(713) 695-5944	774-366

Write to us in Johannesburg for a free A4 size frameable print of the character shown in this advertisement. Please quote No:79/227861N.

daar is gevind dat sekere pypleidings en brandstoftenks deur elektrolitiese verwering aangetas is. Die nodige herstel en voorsorgmaatreëls is deur die betrokke partye uitgevoer.

Die kwessie van aarding met betrekking tot elektrolitiese verwering asook die veiligheid en beskerming van toerusting is hersien en by vergaderings breedvoerig bespreek. Die elektriese eienskappe van beton is oorweeg en Komitelede is deur die Voorsitter verwys na 'n gepubliseerde referaat oor interessante navorsing wat etlike jare gelede in die verband uitgevoer is.

Ander sake van belang bespreek of na verwys gedurende die periode onder oorsig sluit die gebruik van sonselle vir katodiese beskerming van onderaardse strukture ens., korrosie van gegalvaniseerde warm waterpype soos deur die WNNR ondersoek, asook stoomketels en geassosieerde stoomturbines in.

Die notule van die Hoof- en ander streekskomitees is ontvang en bespreek met die gevolglike uitruiling van nuttige inligting.

Van besondere belang was die verwysings na gebruikskodes en 'n metode vir die meet van kabel-omhulsel potensiaal by wyse van 'n veraf geleë half-sel, soos in 'n verslag van die Durban Korporasie beskryf.

Dit is duidelik dat elektrolitiesewering in Wes-Kaapland onder beheer is en dat die huidige aantal vergaderings in die streek voldoende is. Die vergaderings van die komitee is bygewoon deur mnr. T. Pollock, Elektrotegniese Stadsingenieur van Gordonsbaai in die plek van mnr. K. J. Murphy, die VMEO verteenpwoordiger.

Verteenwoordiging van die VMEO op die Wes-Kaaplandse streekskomitee is die moeite werd. Lede in die streek word voortdurend op hoogte gehou van ontwikkelings op die gebied van elektrolitiesewering en word aangemoedig om enige werings probleme soos in hul ondernemings ondervind aan die komitee voor te lê.

certain pipe lines and fuel tanks were found to have been affected by corrosion. The necessary remedial action has been taken by the bodies concerned.

The question of earthing in relation to electrolytic corrosion, safety and protection of equipment was reviewed and discussed at length during meetings. The electrical properties of concrete were considered and the Chairman referred Committee members to a published paper on some interesting associated research which had been carried out some years ago.

Other matters of interest discussed or referred to during the period under review, included the use of solar cells for cathodic protection of buried structures etc., corrosion of galvanised hot water pipes as investigated by the CSIR and steam turbines and associated boilers.

Minutes of meetings of the Main and other regional committees were received and discussed resulting again in exchanges of useful information.

Of particular interest was references to codes of practice and a method of measuring cable sheath potentials by m,eans of a remotely placed half cell described in a report by the Durban Corporation.

It is evident that electrolytic corrosion in the Western Cape is still under control and that the present frequency of meetings is therefore adequate. Meetings of the Committee were attended by Mr. T. Pollock, Town Electrical Engineer of Gordon's Bay, on behalf of Mr. K. J. Murphy, the AMEU Regional Representative.

Representation of the AMEU on the Cape Western Regional Field Committee is regarded worthwhile. Members in the Region are continuously informed of developments in this sphere and encouraged to submit any corrosion problems experienced by their Municipalities to the Committee for consideration.

K. J. MURPHY
VERTEENWOORDIGER/REPRESENTATIVE

DIE SUID-AFRIKAANSE NASIONALE KOMITEE INSAKE DIE WÊRELDENERGIE KONFERENSIE (SANKWEK)

Die jaarlikse vergadering van die Suid-Afrikaanse Nasionale Komitee insake die Wêreldenergiekonferensie is op Vrydag, 17 Februarie 1978, te Megawatpark, Sandton gehou. Die verteenwoordigers van die lede van die komitee is as volg:

SOUTH AFRICAN NATIONAL COMMITTEE OF THE WORLD ENERGY CONFERENCE (SANCWEC)

The Annual Meeting of the South African National Committee of the World Energy Conference was held at Megawatt Park, Sandton on Friday, 17 February 1978. The Constituent Bodies were represented by the following.

DR. R. L. STRASZACKER	—	Voorsitter, Elektrisiteitsvoorsieningskommissie. Chairman, Electricity Supply Commission.
MNR./MR. J. H. SMITH	—	Algemene Bestuurder, Elektrisiteitsvoorsieningskommissie (Eresekretaris). General Manager, Electricity Supply Commission (Honorary Secretary).
MNR./MR. W. BARNARD	—	Elektrotegniese Stadsingenieur, Johannesburg Munisipaliteit, verteenwoordig VMEO. City Electrical Engineer, Johannesburg Municipality, representing the AMEU.
DR. J. P. B. HUGO	—	Namens Dr. A. J. A. Roux, President, Raad op Atoomkrag. Deputising for Dr. A. J. A. Roux, President, Atomic Energy Board.
MNR./MR. A. B. DANEEL	—	S.A. Kamer van Mynwese. Chamber of Mines of South Africa.
MNR./MR. A. A. WEICH	—	Hoofinspekteur van Fabrieke, Departement van Arbeid. Chief Inspector of Factories, Department of Labour.
MNR./MR. N. ORSMOND	—	Staatsmyningenieur, Departement van Mynwese. Government Mining Engineer, Department of Mines.
DR. D. J. KOTZÉ	—	Direkteur Energie, Departement van Beplanning en die Omgewing. Director Energy, Department of Planning and the Environment.
DR. C. C. LA GRANGE	—	Direkteur, Brandstofnavorsingsinstituut van S.A. Director, Fuel Research Institute of S.A.
DR. J. F. KEMP	—	Wetenskaplike en Nywerheidsnavorsingsraad. (WNNR). Council for Scientific and Industrial Research. (CSIR).
MNR./MR. H. B. NORMAN	—	Hoofingenieur (Stelselbeplanning) Elektrisiteitsvoorsieningskommissie verteenwoordig S.A. Instituut van Elektriese Ingenieurs. Chief Engineer (System Planning) Electricity Supply Commission, representing the S.A. Institute of Electrical Engineers.
PROF. R. K. DUTKIEWICZ	—	Professor van Meganiese Ingenieurswese, Universiteit van Kaapstad, verteenwoordig S.A. Instituut van Meganiese Ingenieurs. Professor of Mechanical Engineering, University of Cape Town, representing the South African Institute of Mechanical Engineers.
MNR./MR. G. B. JACK	—	Suid-Afrikaanse Spoorweë. South African Railways.

PROF. D. C. MIDGLEY — Professor van Hidroulika, Universiteit van die Witwatersrand.
Ondervoorsitter van die Suid-Afrikaanse Nasionale Komitee vir Groot Damme.
Professor of Hydraulics, University of the Witwatersrand.
Vice-Chairman of the South African National Committee of Large Dams.

Die volgende sake is op die vergadering bespreek:

1. Dr. R. K. Dutkiewicz het gerapporteer dat die beloofde verslag oor sonverwarming op datum gebring word na die skerp kostestygings van die afgelope jaar en behoort binnekort gereed te wees.

   Die Universiteit van Kaapstad ondersoek tans die gebruik van sonenergie vir huishoudelike verwarming en het dit nodig gevind om die tariewe wat by hul berekening van ekonomiese faktore gebruik word te verhoog.

   Mnr. W. Barnard het daarop gewys dat by die bespreking van sonverwarming daar onderskei moet word tussen bestaande huise en nuwe huise. Die koste verbonde aan die twee gevalle verskil en dat dit moontlik is om 'n stelsel spesifiek vir nuwe huise te ontwerp wat besparings sou meebring.

2. Vergadering in Istanbul, Turkye, September 1977.

   Die Voorsitter het na die afwesigheid van S.A. by die naamrolle van die spesiale komitees wat aangestel is om spesifieke take te verrig, soos byvoorbeeld die Oorsig van Energiehulpbronne 1980, verwys en lede vir hul menings gevra oor die vraag of S.A. aktief moet strewe om deel te neem aan die werk van dié komitees.

   Dit was algemeen aanvaar dat die hidroelek-triese hulpbronne van Afrika besoedelingsvrye energie aanbied wat die behoeftes van Europa en Klein-Asië tot die einde van die eeu en verder kan voorsien maar dat die hoof probleem die gebrek aan las was en dat S.A. se deelname om die rede onontbeerlik is.
   Dit was uiteindelik besluit dat S.A. sou kyk wat gebeur en nie probeer om deelname aan enige komitee op die stadium af te dwing nie.

   Mnr. W. M. de Boor, wat die Konferensie in 'n private hoedanigheid bygewoon het, het aan SANKWEK verslag gedoen oor die vergadering in Istanbul.

   Hy het daarop gewys dat die belangrikste gevolg was die voorspelling wat aan die einde van die Konferensie gemaak is, insake die wêreldwye neigings vir energie verbruik. Die verwagting is dat die wêreld se aanvraag na energie met ongeveer 3% sal toeneem en dat kernkrag onvermydelik 'n al hoe groter rol gaan speel. Die gemiddelde groei tempos van verskillende dele sal as volg daar uitsien:

Organisasie vir Ekonomiese Samewerking en Ontwikkelde Lande	2% per jaar
Oostelike Groep van Lande	3,7% per jaar
Ontwikkelde Lande	4,4% per jaar

3. Die elfde Wêreldenergiekonferensie sal in München, Wes-Duitsland gehou word van 8 tot 12 September 1980, en die spesiale onderwerp sal die energie behoeftes van die ontwikkelende lande wees.

   Die volgende gewone algemene vergadering van SANKWEK sal op 20 April 1979 gehou word.

The following matters were discussed:

1. Dr. R. K. Dutkiewicz reported that the report on solar heating which he had promised, was being updated after the sharp price increases of the past year, but should be ready soon.

   The University of Cape Town was looking at solar energy for domestic heating and they had found it necessary to increase the tariff used for their calculations of the economics of such energy.

   Mr. W. Barnard said that in a discussion of solar heating, one should differentiate between the installation of solar heating systems in existing installations and new installations. The economics of the two installations were entirely different, and it would be possible to design a system specially to suit new installations and thus achieve some economy.

2. Meeting in Istanbul, Turkey, September 1977.

   The Chairman referred to the absence of S.A. from the panels of the special committees appointed for specific purposes, e.g. the Survey of Energy Resources 1980, and asked members for their opinions on the question whether S.A. should actively pursue participation in the work of these committees.

   Although it was generally agreed that Africa's hydro-electric resources offered pollution-free energy, which could supply the needs of Europe and Asia Minor to the end of the century and beyond, the real problem was lack of load and therefore South Africa's participation was vital.
   It was finally resolved that South Africa would adopt a "wait and see" policy and not attempt to force itself onto any committee at this stage.

   Mr. M. W. de Boor, who attended the Conference in his private capacity, reported to SANCWEC on the meeting in Istanbul.

   He said the most important technical result was that of the forecast made at the conclusion of the Conference concerning world-wide development of energy consumption. It was concluded that the world energy demand was going to increase by approximately 3% p.a. and that nuclear power was inevitably going to play an increasing role. The average growth rates were sibdivided as follows:

Organization for Economic Co-operation and Development Countries	2% p.a.
Eastern Block Countries	3,7% p.a.
Developing Countries	4,4% p.a.

3. The 11th World Energy Conference is to be held in München, West Germany from 8 to 12 September 1980, inclusive and the special topic will be the energy requirements of the developing countries.

   The next ordinary general meeting of SANCWEC will be held on 20 April 1979.

W. BARNARD
VERTEENWOORDIGER/REPRESENTATIVE

MNR. W. BARNARD, Johannesburg:

Mr. President, Ladies and Gentlemen, as you know this World Energy Conference is held every three years, the last one was held in Istanbull and the S.A. delegates were not given visas to go to Istanbull so we were unable to attend.

In 1980 it is the intention in September to have the World Energy Conference in München in Germany, and the President for that Conference cam out last week to S.A., had a meeting with us in order to assure us that we will be welcome in Germany, and has asked that we should send a strong delegation from S.A. Dr. Straszacker asked me to tell this convention that he would very much like the support of the AMEU for the World Energy Conference in 1980.

He also asked me to bring to your attention a very important document which has been issued by the World Energy Conference. This is the World Energy's Conferences executive summaries on conservation measures, and our organisation will be acquiring a copy of this publication, but he says that it is of tremendous value particularly at present time to know what steps other countries throughout the world are taking in energy conservation.

Thank you.

VERSLAG OOR DIE WERK VAN DIE HOOGSPANNINGSKOÖRDINERENDE KOMITEE

Die Komitee het formeel op 31/10/77 byeengekom en informeel op 13/5/77 (te Kriel Kragsentrale) en op 25/4/78 (te Richardsbaai). Die volgende formele vergadering sal gedurende Oktober 1978 plaasvind.

Die werk van die Komitee is hoofsaaklik gedoen deur 'n aantal werksgroepe, soos volg:

1. BEAARDING

(a) Die SABS sal eersdaags 'n Bedryfskode oor Beaarding uitreik, sowel as 'n spesifikasie vir aardstawe waarin spesiale aandag geskenk word aan die probleem van korrosie.

(b) Die gebruik van staal bewapening in betonstrukture as 'n aardingsmedium is op 'n simposium in Johannesburg in Maart 1978 bespreek en herhaal in Mei 1978 in Durban.

(c) Die gebruik van aardlekkasie toestelle in meervoudige aardbeveiligingsstelsels is ingesluit in die opdrag van die werksgroep.

2. STELSELSTEURINGS

(a) Die uitwerking van skakelstuwings op motor windinge word bestudeer en 'n aantal toetse is op Evkom kragsentrales uitgevoer. Riglyne vir hulp van motorvervaardigers en gebruikers sal opgestel word.

(b) Evkom se beleid in verband met die gebruik van neutrale aardkompensators is verander en 'n nuwe amptelike opdrag sal binnekort uitgereik word.

(c) Voortspruitend uit probleme wat in Natal ondervind word, is die werksgroep besig om die toelaatbare onbalans in toevoerspanning en die onderlinge bydraes tot onbalans van voorsiener en verbruikers, te ondersoek.

(d) Die beheer en maksimum inhoud van bofrekwensies in elektrisiteitsvoorsiening word bestudeer as deel van 'n langtermyn ondersoek na die moontlike uitwerking van grootskaalse gebruik van batterylaaiers vir elektriese voertuie.

3. ISOLERING

(a) Studies van kruipafstande vir isolators en isolatorstringe word nog bestudeer en verdere toetse is onderweg. Hierdie werk is nou verwant aan die werk van die SABS se Komitee oor Isoleringskoördinasie.

(b) 'n Loods-skema vir motor foutaanwysing is voltooi en dit sal op 'n landswye basis deur die WNNR ingestel word.

4. WEERLIG

(a) Voortvloeiend uit die vroeëre WNNR ondersoeke op 'n 11 kV munisipale verspreidingsleiding, het die WNNR en Evkom onlangs 'n eensoortige samewerkende navorsingsprojek ingestel wat die konstruksie en instrumentering van 'n 10 km lengte van verteenwoordigende plattelandse verspreidingsleiding behels. Die vernaamste oogmerke van die projek is die bestudering van die weerlig-werksverrigting van die leiding, en die studie en optimatisering van verskillende beveiligingstegnieke.

(b) Werk by die Cabora Bassa leidingstoetsaanleg het voortgegaan met die vernaamste nadruk hierdie seisoen op die opname van stelselskakelstuwings gedurende Evkom se inwerkingstellingsprosedures.

(c) Die landswye blitsstraal tellingsprogram werk op roetine en die doelwit is nou om maandelikse kaarte van opnames binne twee maande vanaf die onderhewige maand op te stel, tesame met lyste van die afsonderlinge tellingsopnames.

(d) Evkom se afgeleier ontlaaistroom opnames het 'n aansienlike hoeveelheid gegewens opgelewer wat nou in die proses van ontleding is, en hulle verslag word in die nabye toekoms verwag.

(e) Fondse is nou beskikbaar gestel vir deelname aan die wêreldwye weerlig oorsigskema van die ICAE, en dit word verwag dat die toerusting teen die einde van 1978 afgelewer mag word. Aandag is gewy aan die weersateliet foto's wat nou beskikbaar is.

Amptenare van die opsporingstasie sal genader moet word in die verband, met die oog op die moontlikheid om wolkbedekking in verband te bring met aantekeninge van landkaart opnames sowel as met aanduidings van die weerlig plekbepalingstelsel.

REPORT ON THE WORK OF THE HIGH VOLTAGE CO-ORDINATING COMMITTEE

The Committee met formally on 31/10/77 and informally on 13/5/77 (at Kriel Power Station), and on 25/4/78 (at Richards Bay). The next formal meeting will be held in October 1978.

The work of the Committee is mainly dealt with through a number of working groups as follows:

1. EARTHING

(a) The SABS is shortly to issue a Code of Practice on Earthing, as well as a specification for earth rods in which particular attention is given to the corrosion problem.

(b) The use of steel reinforcement in concrete structures as an earthing medium was discussed at a symposium held in Johannesburg in March 1978 and repeated in May 1978 in Durban.

(c) The use of earth leakage devices on protective multiple earth systems has been included in the terms of reference of the working group.

2. SYSTEM DISTURBANCES

(a) The effect of switching surges on motor windings is being studied and a number of tests have been carried out at Escom power stations. Guide lines for the assistance of motor manufacturers and users are to be prepared.

(b) Escom's policy regarding the use of neutral earthing compensators has been changed and a new directive is to be published shortly.

(c) Arising from problems experiences in Natal, the working group is examining the permissible unbalance in supply voltage and the respective contributions to unbalance by supplier and users.

(d) The control and maximum content of harmonics in electricity supply is being studied as part of a long term investigation into the possible effects of wide scale use of battery chargers for electric vehicles.

3. INSULATION

(a) Studies of creepage distances for insulators and insulator strings is still being studied and further tests are under way. This work is closely related to the work of the SABS Committee on Insulation Co-ordination.

(b) A pilot motor fault reporting scheme has been completed and this will be introduced on a national basis by the CSIR.

4. LIGHTNING

(a) As a sequel to the earlier CSIR investigations on an 11 kV municipal distribution line, the CSIR and Escom have recently initiated a unique collaborative research project, involving the construction and instrumentation of a 10 km length of representative rural distribution line. The principal objectives of this project are the study of the lightning performance of the line, and the study and optimization of various protective techniques.

(b) Work at the Cabora Bassa line testing station has continued with the main emphasis this season being upon the recording of system switching surges in the course of Escom's commissioning procedures.

(c) The national lightning flash counter programme is operating routinely and the intention now is to produce monthly maps of activity within two months of the calendar month involved, together with lists of the individual counter recordings.

(d) Escom's arrester discharge current recordings has yielded a considerable amount of data which is now in the course of analysis, and their report is anticipated in the near future.

(e) Funding has now been made available for participation in the global lightning monitoring scheme of the ICAE, and it is expected that the equipment might be delivered towards the end of 1978. Attention has been given to the meteosat pictures which are now available.

Officials of the tracking station are to be approached in this regard, in view of the possibility of correlating cloud cover with counter map registrations as well as with the indications from the lightning location system.

(f) Daar is kennis geneem dat die eersdaagse simposium oor donderstorms vir September hierdie jaar beplan is. Ook is daar kennis geneem dat dr. Anderson en mnr. Eriksson die vergadering van die CIGRE werksgroepe vir weerlig en blitsstraaltellers in Augustus sal bywoon, sowel as die vergadering van die werksgroep oor vergelykende weerligparameters van die ICAE.

5. ELEKTROMAGNETIESE VERENIGBAARHEID — EMV

Die Sekretaris het verslag gedoen dat die handleiding oor weerligbeveiliging by elektroniese inrigtings, voltooiing nader en het ook sekere probleme in die bestek van EMV behandel. Die Komitee het geoordeel dat, alhoewel hierdie handleiding oorspronklik opgestel is onder kontrak met Armscor, wyer verspreiding in die bedryf van waarde kan wees. Daar is voorgestel dat mnr. van Wyk en mnr. Eriksson die moontlikheid sal ondersoek om wyer publisiteit aan hierdie dokument te gee en wanneer dit beskikbaar is, dat dit vir verkoop aan die bedryf aangebied word.

6. ROTERENDE MASHIENE

Hierdie groep wy spesiale aandag aan veldtoetse met die werking van vakuumkontaktors op motore en die gevolglike skakelstuwings, sowel as die toetsing van isolasie van hoogspanningsmotorspoele.

(f) The forthcoming thunderstorm symposium planned for September this year was noted. It was also noted that Dr. Anderson and Mr. Eriksson would be attending the meetings of the CIGRE working groups on lightning and on lightning flash counters in August, as well as the meeting of the working group on comparative lightning parameters of the ICAE.

5. ELECTROMAGNETIC COMPATIBILITY — EMC

The Secretary reported that the lightning protection guide on electronic installations was nearing completion and also dealt with certain problems in the field of EMC. The Committee felt that although this guide had originally been prepared under contract to Armscor, wider circulation in industry would be valuable. It was proposed that Mr. van Wyk and Mr. Eriksson should investigate the possibility of giving this document wider publicity and once available should be offered for sale to industry.

6. ROTATING MACHINES

This group is giving special attention to field tests with vacuum contactor operation of motors and consequent switching surges, as well as the testing of high voltage motor coils.

W. BARNARD
VERTEENWOORDIGER/REPRESENTATIVE

TOEKENNING VAN ERELIDMAATSKAP
CONFIRMENT OF HONORARY MEMBERSHIP

MR. P. J. BOTES, President:

Ladies and Gentlemen, — First of all I have to apologise for the absence of Dennis Fraser — he took ill this morning. We have not heard from him since, but we trust that his illness is not serious.

Your Worship, the Mayor of Roodepoort, Madame Mayoress, distinguished guests, ladies and gentlemen, we are delighted to have you all back here this afternoon — particularly the ladies. It is always so much more pleasant to have them with us.

The first item on the agenda this afternoon is the conferment of Honorary Membership of the AMEU. The decision to bestow honorary membership of the Association is taken only after careful consideration and in exceptional cases. It is my privilege first to call on Ken Robson, our Past President, who will propose conferment of Honorary Membership on Mr. R. W. Barton.

MR. K. G. ROBSON, East London:

Mr. President, Mr. Mayor, Madam Mayoress, distinguished guests, ladies and gentlemen.

There are some occasions when the sense of privilege attending a formal duty has added to it a feeling of extra special pleasure. This is for me such an occasion, as I submit to you the name of **Robert William Barton,** Registered Professional Engineer, for Honorary Membership of the AMEU.

Bob Barton began his municipal career in 1946 as Town Electrical Engineer of Edenvale. In 1949 he joined the Anglo American Corporationwas Electrical Engineer of the burgeoning mining town of Welkom. In 1953 he was — in his own words — taken over with the electrical services from Anglo American by the Welkom Village Management Board! Later the Village Management Board becae a Town Council and subsequently a City Council, of which he presently is City Electrical and Mechanical Engineer.

His career is remarkable in that he was the first and has been the only electrical engineer of a modern South African city which grew out of the bare veld of the Orange Free State.

His contribution to the municipal electricity supply industry in South Africa, through his work and service to the AMEU, has been outstanding. Elected to the Executive Council in 1961 he served continuously until 1975. He held the office of President in 1964/65 and served the Association and its membership in that capacity with distinction. In reply to two questions yesterday he told me he has not missed one Convention or Technical Meeting throughout his municipalit electrical engineering career.

A founder member of the Reef Municipal Electrical Engineers' Association, later to become the Highveld Branch of the AMEU, he is probably the only one of that original band of engineers still in municipal service.

A man of diverse interests and talents with a delightful sense of humour, he has left his mark on the community to which he has given thirty years of his life — and to this a succession of his Councillor friends will testify unreservedly.

Amongst his special interests have been:

The National Occupational Safety Association of which he was Chairman of the Central Region for fifteen years, a member of the National Management Committee for some years and Vice-Chairman for two terms of the National Board of Directors.

He is a fellow of the South African Institute of Electrical Engineers and a member of the Institution of Certificated Mechanical and Electrical Engineers, South Africa, having also been a founder member of the Orange Free State Branch.

Bob is held in the highest esteem by those of his friends and colleagues who have been provileged to share his experience, enjoy his friendship and admire his example.

Honorary Membership is the highest honour the AMEU can bestow on a member, who shall be a distinguished person whom the Association desires to honour for outstanding services. And I personally find it sometimes difficult to express, in the right kind of terms, a final tribute, and so if I may be forgiven for using the words of somebody far more able than I, and this goes back many years Bob, to the time when I came across these words of Joseph Addison in his famous Roman tragedy "Cato". The Republican Cato speaks to the Senator Sempronius:

"Tis not in mortals to command success,
But we'll do more Sempronius, we'll deserve it."

Most surely Mr. President Bob Barton has done the more — he has deserved success.

Mr. President, it is my privilege to propose formally that Honorary Membership of the Association of Municipal Electricity Undertakings of South Africa be conferred on Mr. Robert William Barton.

MR. P. J. BOTES, President:

Thank you Mr. Robson. Will Bob Barton come forward please to receive his Honorary Membership Certificate which reads:

"The AMEU of South Africa. Be it known hereby that this Certificate has been presented on behalf of All the Members of the Association to ROBERT WILLIAM BARTON.

Mr. Barton was elected as an Honorary Member of the Association of Municipal Electricity Undertakings of S.A. in 1979, and this Certificate is a token of appreciation of his long and loyal service in fostering the objects of the Association.

Signed this 1st day of March 1979."

Congratulations.

African Cables lead the way to brighter black townships

Imagine what the electrification of a township means. No more pall of smoke from cooking fires. No more unlit, dangerous streets. A hot breakfast every morning. Many new household appliances to make life a lot easier and more enjoyable.

And the key to it all? Modern, economic distribution systems, based on our latest economical CNE (combined neutral/earth) cable. A product especially designed for this purpose. Another product of our continuing development programme.

african cables

South Africa's Life Lines.

8691/4/Adapt Lindsay Smithers - FCB

Mr. Bob Barton receives his Honorary Membership Certificate from Mr. Piet Botes, President of the AMEU.

MR. R. W. BARTON, Welkom:

Mr. President, I must say I'm just about too full for words, and it has nothing to do with the excellent lunch.

If I had known that you people were going to be so kind to me on this occasion, I'm sure I would have retired years ago.

I would like to thank my very good friend, Mr. Ken Robson, for those kind words he used; it is so hard to believe that I'm the chap that he was talking about. But I must say I loved them and it certainly did a lot for me and I will remember them for a very long time.

It has been a great joy for me to be associated with the Association and all of you, and I can assure you I shall remember you all for a very long time.

It can be said that I have reached the peak of my Municipal career, and I will retire content.

Thank you one and all for this very great honour which you have done me, may all your tomorrows be good ones.

Thank you Mr. President.

MR. P. J. BOTES, President:

Thank you Bob.

Dit is nou vir my 'n voorreg om mnr. Wessel Barnard, Stadselektrotegniese Ingenieur van Johannesburg te vra om die toekenning van Erelidmaatskap aan Rdl. H. J. Hugo van Roodepoort voor te stel.

MR. W. BARNARD, Johannesburg:

Henning Johannes Hugo was born on the 22nd November 1915 in Petrusburg in the Free State. Ek dink nie ons kan dié feit teen hom hou nie, aangesien daar geen melding in sy kurrikulum is dat hy ooit rugby vir die Vrystaat gespeel het nie.

His loyalty to his employers and dedication to his fellow men is borne out by his record of 41 years with the Railways and 25 years as a Councillor of Roodepoort. This period includes two terms as Mayor, culminating in the freedom of the City being bestowed upon him.

Dit is alte seker 'n groot eer vir die VMEO dat 'n man van sy gestalte nie net 'n lid van ons Uitvoerende Raad is nie, maar ook dat ons hom kan noem as 'n vriend.

Raadslid Hugo het 13 Konvensies, 4 Tegniese vergaderings en sedert 1971, elke Uitvoerende Raad en Dagbestuur vergadering bygewoon.

Oom Hennie is lewenslange lid van S.A. Hulpliga, Maraisburg Rolbalklub en ook Roodepoort Hengelvereniging.

Ek sou gedink het dat na sy ondervinding met visvang tydens die Konvensie in Kaapstad in 1958, hy ten minste van laasgenoemde sou bedank het.

By dié geleentheid het Oom Hennie met 'n vissersboot op see gegaan om tuna te gaan vang. Met die terugkomslag het die boot in 'n storm beland en het albei enjins ingegee. 'n Polisieboot het om 12-uur die nag by hulle aangekom en, na die see bedaar het, is hulle na Simonstad terug gesleep, waar hulle 5-uur die volgende more aangekom het, na 24-uur op see.

Mnr. Derick Brown, destydse Elektrotegniese Ingenieur van Roodepoort, het by Simonstad Polisiekantoor gewag, waar hy reeds in sy gedagte 'n verslag aan die Raad voorberei het, wat hy dan met die volgende treffende woorde sou afeindig:

> *"It is with regret that I have got to report that my Chairman is missing, presumed lost at sea."*

Van toe af het Raadslid Hugo besluit om liewers die verrigtinge van die VMEO by te woon.

Councillor Hugo is a man of high integrity and moral character and, above all, his humulity and humanity make him one of our eminent public figures of today.

Plutarc, that Ancient Greek Phillosopher wrote —

> *"If my deeds be good, my memory be green."*

Councillor Hugo will be remembered long after his activities in the AMEU cease.

Meneer die President, dit is met genoeë dat ek aanbeveel dat hierdie Vereniging Erelidmaatskap aan Raadslid Henning Johannes Hugo toeken vir voortreflike diens wat hy gelewer het aan die VMEO en ook aan sy medemens.

MNR. P. J. BOTES, President:

Baie dankie mnr. Barnard, sal mnr. Hennie Hugo asseblief na vore kom.

Die Vereniging van Munisipale Elektrisiteitsondernemings van S.A.

Hiermee word meegedeel dat hierdie Sertifikaat namens alle Lede van die Vereniging toegeken is aan HENNING JOHANNES HUGO.

Mnr. Hugo is gekies as 'n Erelid van die Vereniging van Munisipale Elektrisiteitsondernemings van S.A. in 1979, en hierdie Sertifikaat is 'n aandenking vir die waardering van sy verbintenis en getroue dienste ter bevordering van die doelstellings van die Vereniging. Geteken hierdie 1ste dag van Maart in die jaar 1979.

Veels geluk meneer Hugo.

Rld. Hennie Hugo ontvang sy Erelidmaatskapkenteken van die President, mnr. Piet Botes.

RLD. H. J. HUGO, Roodepoort:

Meneer die President, Meneer die Burgemeester, dames en here. Ek wil aan mnr. Barnard sê baie dankie vir hierdie vriendelike woorde wat hy aan my gerig het.

How that very close secret story about the fishing expedition leaked out, I would not know, — must be a sort of a Watergate business. Anyway I became a very sensible man after that experience, and I think it is only a very clever or a very foolish man who goes out deepsea fishing.

It was mentioned that I worked on the Railways for many years, and I think it only fair that I should tell the delegates that there I gained at least some experience with electricity!

It was during the depression years and I was sent to work at Braamfontein station, where they had those suburban coaches, with electricity

supply for lighting provided by a 12 Volt battery. My job was to operate the main switch of the coach and check whether all the lights were burning; I cleaned all the shades and replaced all the globes that were missing. I used to carry a canvas bag over my shoulder in which were all those small replacement globes — they were as big as a 50c piece! One morning I arrived very early, being a responsible man; it was still dark, and when I got to the locker room I found the light was out! I thought: this is more or less in my line — the replacement of globes, so I went into the storeroom and out of my canvas bag I took one of those globes and got onto the table and I put it in. I got down and pressed the switch — there was a great flash and a terrific explosion and Braamfontein was plunged into darkness. You would not believe me, but still to this day I am worried about what caused that explosion!

Meneer die President, ek wil graag in die eerste plek my dank en waardering betuig teenoor my Raad vir die geleentheid wat hulle aan my gegun het om al hierdie jare hierdie Konvensies by te woon. Dit is deur hulle toedoen dat hierdie voorreg en eer my vanmiddag kan te beurt val.

Ek wil dan hiermee ook die Vereniging bedank vir hierdie besondere groot eer wat hulle aan my bewys het, ek waardeer dit werklikwaar, want dit sal die verhouding wat reeds tussen my en die Vereniging bestaan kan laat voortbestaan, selfs na ek as Raadslid bedank het. Ek waardeer werklikwaar hierdie mooi gedagte van u. Wanneer ek eendag 'n ou man is en terugdink aan die mooi dinge wat my in hierdie lewe toegeval het, dan sal ek dink aan die Vereniging, en ek sal dink aan die groot eer wat u aan my bewys het.

Ek dank u.

AFSLUITINGSTOESPRAKE — CLOSING ADDRESSES

MNR. P. J. BOTES, President:

Dames en here, dit is vir my 'n groot voorreg om Sy Agbare, die Burgemeester van Roodepoort, Rld. Bennie van der Walt aan die woord te stel om namens die Stad Roodepoort 'n par afsluitingswoorde tot u te rig.

RLD. BENIE VAN DER WALT, Burgemeester, Roodepoort:

Meneer die President, dit is blykbaar die gebruik van die VMEO om 'n Burgemeester te laat werk, want hy moet 'n verwelkomingswoord spreek, hy moet 'n afsluitingswoord spreek, en so tussenin moet hy Sekretaris wees van die Vereniging.

Meneer die President, ek wil graag van die geleentheid gebruik maak om u van harte geluk te wens met die hoë onderskeiding wat u te beurt geval het met u verkiesing tot President van die VMEO. Ek wens u 'n baie suksesvolle ampstermyn toe.

Daar het werklik 'n paar seldsame gebeurtenisse by hierdie Konvensie plaasgevind, naamlik:

1. Dat Erelidmaatskap aan Raadslid Hennie Hugo toegeken is. Hy is ook 'n Ereburger van Roodepoort en reeds 25 jaar lank 'n Stadsraadslid van die Stad;

2. Dat u, Meneer die President, die Stadselektrotegniese en Meganiese Ingenieur van Roodepoort is vir ongeveer 18 jaar, en nou tot President van die VMEO verkies is; en

3. Dat ekself die Stad Roodepoort verteenwoordig as Burgemeester by hierdie geleentheid, terwyl ek in my professionele hoedanigheid ook optree as die Sekretaris van die VMEO. Toe die Uitvoerende Raad van die VMEO my aangestel het as Sekretaris in 1972 het ek nooit kon droom dat die omstandighede so 'n wending in 1979 sou neem nie. Ek was vir alle praktiese doeleindes uitgesluit van enige plaaslike bestuur se beheer, maar Roodepoort het die gebied waar ek woonagtig is in 1974 ingelyf. Die ingelyfde gebied het 'n Raadsverteenwoordiger gekry en daardie mantel het op my geval, min wetende dat ek in 1978/79 Burgemeester sou wees van Roodepoort, die Stad wat die Gasheer vir die Konvensie sou wees. Dit is voorwaar 'n geskiedkundige geleentheid in die bestaan van die VMEO.

Ek wil graag vir beide mnre. Hugo en Barton baie hartlik gelukwens met die eer wat hulle te beurt geval het, met die toekenning van Erelidmaatskap.

Mr. President, being a Secretary is no joke. If he writes a letter to Members, it is considered too long to read; if he sends a postcard instead, is too short! If he issues a newsletter, he's a spendthrift. If he offers a suggestion, he's a know-all. If he says nothing, he's useless. If the attendance at the Annual General Meeting is slack, he should have called the Members up. If he calls them up, he's a pest. If he asks a Member for subs, he's insulting. If he does not, he's lazy. If the meeting is a big success, the Executive gets the praise. If it's a failure, the Secretary gets the blame. To paraphrase:

"Ashes to Ashes, Dust to Dust; If others won't do it, The Secretary must!"

Ladies and gentlemen, it is difficult to imagine a more exciting climax to a Mayoral year than the events connected with this convention. The proceedings are quite unforgettable and will never be erased from the memories of the Mayoress and myself.

Mr. President, we have now come to the end of this, the 46th Convention of the AMEU, and one may ask whether it was a success or not. I submit that it was successful for the following reasons:

1. All information was presented in an understandable manner to all the delegates. It captured their interest so as to create an involvement on their part.

2. It assisted the delegates in the evaluation of the information presented.

3. It showed the delegates how they might benefit directly or indirectly from the information they have acquired and how to implement these decisions to obtain the benefit.

I would like to convey my congratulations to the speakers for the excellence of their papers. It makes one realise that the Electrical Engineering Industry has a prosperous future in South Africa and can aim to achieve world leadership. There is no doubt in my mind of our Technical Leadership and Training in Africa.

And now, Mr. President, I would like to inform you and the Members of the new Executive Council what the Code of Practice for a good Executive Councillor is. A good Executive Councillor must follow these rules:

"Never arrive on time; this stamps you as a beginner. Do not say anything until the meeting is half over; tis stamps you as being wise.

Be as vague as possible; this avoids irritating the others.

When in doubt, suggest that a Sub-committee be appointed. Be the first to move for adjournment; this will make you popular; It is what everyone is waiting for."

We of the City Council of Roodepoort are proud too of the part we have played in assisting with the arrangements of this Convention.

May I express the hope that many who are present here today, will be around at the next Convention.

I thank you.

MNR. P. J. BOTES, President:

Dames en here, wat miskien minder bekend is, is die feit dat Bennie van der Walt die tweede Raadslid in die geskiedenis van Roodepoort is wat met een stem ingekom het, in sy geval die stem van die Administrateur van Transvaal.

Baie dankie Bennie.

Now we come to the next item, and that is the closing address on behalf of the Affiliates.

Your Worship, the Mayor, Ladies and Gentlemen, as Ken Robsaon said at the Convention in East London, we have very fine traditions in the AMEU and the one I always look forward to is the closing address on behalf of the affiliates. This year we will call on Mr. Dave Soons to make this Closing Address.

MR. D. SOONS, Affiliate:

Mr. President, Mrs. Botes, Mr. Mayor, Mayoress, Ladies and Gentlemen — Thank you for the great honour you have done me today in asking me to make the closing address on behalf of the Affiliates at this Convention.

Like that of Eric Sykes, my Afrikaans is very limited, ahd I wonder if this is the first time that a Cockney has given an address at the R.A.U. As a marketing man, the only Afrikaans I get to say at most of our functions is "Drank is op die huis" — and that usually empties the hall in four seconds flat!

I cannot claim to be a true-born Cockney either, because to be a trueborn Cockney one must be born within the sound of the bells of Bow Church — and to do that these days one has to be a Pakistani!

However, it is perfectly true that for a number of years I operated as a professional comedian in the U.K., but I deplore the insinuation made earlier today by one of the delegates that one must be a comedian to work for any AMEU affiliate.

Since coming to South Africa my public speaking has been limited to Company presentations or the occasional Rotary Club dinner, and I notice that the AMEU and the Rotarians have something in common in

Mr. D. Boons addressing the Convention.

that they both wear name tags. I have recently discovered that this is not so much for identifying each other at the function, but rather to assist the police in making sure that people get home after the Civic Reception.

I have not been employed in the electrical industry for very long, and I must say that I find some aspects of the industry very confusing. For instance, after the Civic Reception last night, I got on the bus to go back to the Hotel and I sat there for ¾-hour before I realised I was sitting in the toilet. Until the truth dawned on me I was beginning to think that some Electrical Engineers were abusing the Public Transport system rather horribly.

Ladies and Gentlemen, I am going to make this address rather short. Not because we are running out of time, and not because to do so would follow the theme of the Convention of conservation of energy, but rather because I am afraid that if these gentlemen sit on this rostrum much longer, they will suffer from a severe attack of Greenfly.

So, to conclude, it may be of interest to the delegates to know that we are having trouble at home with our large tom-cat.

We acquired him as a kitten about two years ago, and shortly after he had fully grown we noticed that the number of cats in our area was increasing at an alarming rate. This feline population explosion got to such proportions that our neighbours lodged a formal complaint about our cat's sexual activities — one couple down the road stating that they were even afraid to let their Great Dane out late at night.

Something had to be done about this situation, of course, so we duly had our cat doctored, and for some weeks he sat morosely at home, hardly eating, and only venturing outside to perform the necessary calls of nature.

Then, suddenly, he started vanishing every night and, quite inexplicable, the cat population started increasing at an even more alarming rate. The neighbours began complaining about our cat again, and even though we knew that this was a physical impossibility, we decided to find out what he did on his moonlight trips. Following him one night, we found him in the veldt with about four dozen young tom-cats sitting in a half circle around him — and he seemed to be delivering some sort of lecture.

In my view, there is a moral in this for Municipal Electrical Engineers, and that is:

> *"When you think you have come to the end of your useful working life, don't despair, you can always become a Consultant!"*

Mr. President, Mr. Mayor, Ladies and Gentlemen, thank you once again on behalf of the Affiliates for allowing us to participate in this 46th Convention, which has been extremely informative and conducted in the usual high standards of the Association.

I would like to thank Mr. Robson for two inspiring and extremely active years in the chair, and wish Mr. Botes every success during his exacting term of office to come.

We look forward to meeting you all again at your future meetings, and to close I wish you goodbye, drive safely and God speed.

MR. P. J. BOTES, President:

Thank you Mr. Dave Soons.

Ladies and Gentlemen, Mr. John Morrison, who has so ably presented moist of the closing addresses on behalf of the Affiliates in the past, also retired from service yesterday, but he will be kept on in a Consulting capacity. This means that he will still be with us at our future Conventions. To him and Harvie Theron, who also retired yesterday, we can just say that we pray that you will enjoy good health and enjoy your retirement.

Thank you.

Nou kom ons by die afsluitingswoorde namens die Dames, en ons roep mev. Annatjie van der Walt wat dit sal doen.

Mev. Annetjie van der Walt ontvang 'n ruiker van mev. Urtney Botes.

MEV. ANNATJIE VAN DER WALT, Burgemeestersvrou, Roodepoort

Meneer die President, Geagte meneer die Burgemeester, — daar is iewers 'n groot kortsluiting by hierdie Elektriese Kongres. Ek het nie notas gemaak nie. Hier op die tafel lê 'n papiertjie en die papiertjie sê — Loot, ek sal jou vyf minute, ens. ens., toe vat ek die skoon kant van die papier en ek maak aantekeninge, en glo nou vir my, dat daardie geketingde man van my nou sowaar elke woord gesê het wat ek hier neergeskryf het. Want ek wou begin het deur te sê dat ek nooit in my wildste drome gedink het dat ek ooit hier sal staan in my hoedanigheid nie, en toe sê hy dit.

Maar nouja, ek het al in hierdie Ouditorium die voorreg gehad om te sing, ek het al hier orrel gespeel en vandag moet ek 'n toespraak maak, en dit is vir my 'n baie groot voorreg om hier te kan dankie sê.

Maar voor ek dankie sê, wil ek sê Meneer die President aan u, namens die Dames 'n baie hartlike woord van groot gelukwensing met u verkiesing as President van die VMEO. Ek weet dat u dit met groot waardigheid sal dra, dat u die skouer aan die wiel gaan sit, en met 'n vrou soos Urtney aan u sy sal dit baie goed gaan in die komende twee jaar.

Dan wil ek ook namens my man, hy weet nog net nie daarvan nie, vir u sê, dat u kan staatmaak op ons twee se samewerking ook. U kan maar net daardie knoppie druk en ons sal help, en as u wil huil, kom, en as die moeilikheid druk, kom dan druk ons hom saam. Baie hartlik geluk.

Dan wil ek namens die dames sê, thank you Mr. President, for you and your Committee for inviting the ladies to this the 46th Convention of the AMEU.

We really had a ball of a time, but you will in due course receive a letter of complaint, it will be signed by all the ladies, because we only had two mornings, that's all! You had the afternoons as well. We had three afternoons and it just was'nt good enough. So next time, please Mr. President, try and make your Conference a three-day, or a four-day, or a five-day Conference, so that we can fit in all the things we want to do.

Dan wil ek graag baie dankie sê aan mevv. Leygonie, Le Roux, Van der Walt en Coertzen, en ook aan mnr. Giel Gericke, dit was baie lekker om saam te werk.

Roodepoort as 'n Stad is trots daarop dat hy graag sy gaste goed onthaal, en met u samewerking het dit goed gegaan.

Mev. Annetjie van der Walt, Burgemeesterswrou van Roodepoort, aan die woord.

U weet die ou Gammat het op 'n Saterdagmiddag gestap in die straat, toe sien hy daar is 'n makietie, toe stap hy in, en dit was 'n "jolly party" gewees, hy't so 'n paar doppe weggeslaan, maar hy het nie geweet wat gaan aan nie, en toe kyk hy die spul so deur, en hy sê, "Well, I don't care whether this is a funeral or a wedding, all I know it's a Grand Success."

Meneer die President, ek glo, namens die dames dat dit 'n "Grand Success" was hierdie, ek hoop u stem met my saam.

Dan wil ek vir my man sê, wat my so hard laat werk het, "Ek sal hom nog terugkry," hy weet dit nog net nie, maar ek sal hom weer help en ek sal hom weer bystaan, want die VMEO lê baie na aan sy hart. Hy sê altyd aan my dat ek my moet gedra, want dit is 'n klomp uitgelese manne hierdie. Hulle ken die letter van die wet en hy werk baie graag saam met hulle, daarom offer hy baie van sy tyd op, en ek wil vir hom sê — dankie dat hy dit hierdie keer weer gedoen het, sy organisasie was soos gewoonlik weer goed gewees, eintlik baie goed. Ek wil dit eintlik nie hard sê nie, netnou hoor hy dit dalk. Hy het nou gesê hy moet te veel dinge doen, hy moet 'n toespraak maak van verwelkoming, hy moet 'n toespraak maak om af te sluit, en hy moet 'n funksie reël; maar weet u wat, hy moet ook nog daarvoor betaal. Ons dames het ook gepluk aan sy sak, en hy moet ons rekening ook asseblief betaal!

Ek wil dan vir u sê, baie dankie dat u gekom het na Roodepoort, dankie dat u dit vir ons as dames aangenaam gemaak het by die kongres, u het goed vir ons gesorg, ry veilig huistoe en kom weer terug Rodepoort toe, ons sal u baie graag weer hier wil ontvang.

Baie dankie.

MNR. P. J. BOTES, President:

Baie dankie Annatjie, ons sal u klagte direk verwys na die T.M.V.

Ladies and gentlemen, I have received the following letter from Dennis and Val Fraser:

"Saamwerk maak mag:

Vir ons is dit 'n groot teleurstelling om nie by u almal te kan wees nie, om u te groet. Ons waardeer u vriendskap, u gasvryheid en al die moeite wat u gedoen het om ons gelukkig te maak. Ry veilig huistoe en mag u almal en u gesinne die rykste seëning in die jaar wat voorlê geniet. Ons sien baie uit na u besoek — Durban 1981 — ons sal vier!!!

Our Message:

We are so sad not to be able to be with you all today, but circumstances do not permit it. Dennis and I are so appreciative of all the kindness, thought and affection which has been showered upon us. This Convention will long live in our minds and hearts. We await with joyous anticipation your visit to Durban and we hope that we will be able to make you equally welcome and happy. Bless you all.

We thank all those who have contributed so generously to gifts for our two gracious and hard-working first ladies. We ask them to accept these with our love and appreciation.

Your request is, we know, that your donations so willingly given will leave a mark in Roodepoort too. It is suggested that we ask Mr. President to distribute these on our behalf to:

Bus Drivers: AMEU Bursary Fund and Local Charities."

Thank you.

Ladies and gentlemen Mr. Ken Robson would like to address you.

MR. KEN ROBSON, East London:

Mr. President, Mr. Mayor, Ladies and Gentlemen — This is an unscheduled appearance, it does not appear on the programme.

Mr. President, this is positively the last time I shall appear before this audience at this Convention. My apologies for having inflicting myself on them again, but it is a very real pleasure for me on behalf of all of us who have been here for these most delightful days, to thank you Mr. President and Urtney.

I don't think that delegates to a Convention, who have not occupied that chair, really fully appreciate the demands made on the Chairman. I'm not sure what you found the most difficult part of the job, but I thought I might share this secret with the delegates here as to what I found the most difficult part of the President's job at a Convention. It was finding time to go to the toilet! You have no idea what a tremendous battle that is.

Mr. President, this has been an outstandingly successful Convention, you had some difficulties with the Public Address System, and obviously you accept the full responsibility for that, although there is nothing you can do while you sit there. But you know it has some advantages, because sometimes if we are getting a bit bored and there is nothing coming through on the system, that is quite a relief too, is'nt it?

However you have our assurance Mr. President that we realize that not everything can go just as you want it. You also have our assurance that you have done a magnificent job in the Chair, and I have no doubt at all that you are going to do a magnificent job in the two years that lie ahead of you.

You will give much, but you will get a great deal more in return, and may I couple with you Urtney, for what she has done for the ladies — they really have appreciated it and they will remember you always in Roodepoort and also the Mayor and Mayoress, for their really charming hospitality.

Not only their hospitality — they gave of themselves all the time, and this made a very real impression on those of us who were privileged to share the short time with you here in your lovely City. Unfortunately, we only saw it from the bus, and perhaps that is something to remember for the future.

But on behalf of all of us, our very sincere thanks, our congratulations on the standard of your performance here, and our very best wishes for a wonderful two years. Thank you.

MNR. P. J. BOTES, President:

Thank you Ken for those kind words.

VOTE OF THANKS AND CLOSING OF CONVENTION BY THE PRESIDENT

BEDANKINGS EN AFSLUITINGS VAN DIE KONVENSIE DEUR DIE PRESIDENT

Dames en here, die reëlings wat getref moet word om so 'n Konvensie aan te bied, is legio en dit begin by die eerste los besluite, waar om 'n Konvensie aan te bied en dan versnel die pas stadigaan. Hierdie pas bereik 'n klimaks by die Konvensie, waar jy en jou personeel voluit moet hardloop. Dan eensklaps kom jy by die afsluiting. Die gevoel wat jy as President in hierdie oomblik het, kan ek nie aan u beskryf nie. Die wonderlikste gebeurtenis wat met 'n mens kan gebeur, is om President van die VMEO te word. Dit is dan wanneer jy eerstens jou personeel regtig leer ken, hulle absolute lojaliteit en entoesiasme is aangrypend. Tweedens kom u, die konvensiegangers, en hier vind jy dieselfde gevoel van lojaliteit en die feit dat jy op die hande gedra word. Dit is 'n onvergeetlike geleentheid in 'n mens se lewe.

Dit is dan vir my 'n aangename taak om dankie te sê eerstens aan sy Agbare die Burgemeester van Roodepoort, Rld. Bennie van der Walt. Dankie aan Rld. H. P. P. Mulder, Voorsitter van die Bestuurskomitee van Roodepoort en Raadslede baie dankie vir die osbraai en al die ander geriewe daargestel. Aan die Burgemeester, Rld. Bennie van der Walt en Annatjie in die dubbele kapasiteit waarin hulle hier opgetree het, baie dankie.

Dames en here wanneer ander bugemeesterspare die einde van hulle ampsjaar nader, dan kan hulle nie wag om die leisels af te gee nie en die vermoeienis is duidelik sigbaar. Ek het hierdie burgemeesterspaar ge-

Rld. Bennie van der Walt, Burgemeester van Roodepoort, saam met mnr. Piet Botha, President van die VMEO.

durende die afgelope jaar dopgehou, hulle het baie min funksies gekanselleer en hulle ampsjaar was eintlik gister verstreke, maar soos uself sien, lyk dit of hulle nou eers 'n aanvang met die burgemeestersjaar gaan maak, so vars is hulle. Hulle sal nou weer moet aanpas as 'n gewone raadlidspaar. Dankie aan Annatjie vir die onthaal vir die dames te Kloofendal — feesterrein en die leiding by die verskillende uitstappies van die dames.

Ek vra nou my vrou, Urtney, om aan Annatjie 'n ruiker te oorhandig.

Aan Urtney, my innige dank vir haar bystand en mag ek Annatjie vra om dan aan haar 'n ruiker te oorhandig.

My kollegas en hulle personeel, veral die Parke-departement onder leiding van mnr. Buddy Turner, ek weet nie of hy vanmiddag hier is nie, wil ek besonder bedank vir al die versierings wat gedoen is. Ek moet hier die name noem van mnr. Willie de Bruin, mnr. Theunissen en mnr. Schultheiss. Nie net vir die versierings alhier nie, maar ook by die Osbraai, by Kloofendal Feesterrein waar die Dames onthaal is. Baie dankie ons waardeer dit.

Aan mnre. Koos Liebenberg en Kobus de Beer dankie vir u bemoeienis met die Presidentsrede, die ontwerp van die omslag was dié van die feesembleem. Roodepoort gaan nog gedurende dié jaar sy 75ste bestaansjaar vier, en dit is die eerste keer dat hierdie Feesembleem gebruik is. Die persoon wat die wapen van Roodepoort so pragtig uitgesny het, is mnr. Kobus de Beer, ons opregte dank aan u albei.

My dank aan my sekretaresse, mev. Esmé Leygonie en aan mev. Babs le Roux wat saam die tikwerk ook alhier behartig het. Dankie aan mevv. Theresia Coertzen en Lenie van der Walt wat die inligtingsdiens waargeneem het.

Mnr. Giel Gericke het by tye opgetree as Sekretaris van die Konvensie terwyl Rld. Bennie van der Walt sy burgemeesterlike funksie moes verrig en ek kan aan u meld dat hy verantwoordelik was vir feitlik al die fasette verbonde aan die Konvensie. Baie dankie Giel. Dit was 'n geweldige taak wat op hom gerus het, en hy het dit met presiesheid uitgevoer.

Dan my dank ook aan die persone wat die fotografiese uitstallings gedoen het hier by ons en daar voor, naamlik, Evkom, Johannesburg Munisipaliteit en die W.N.N.R. Dit het alles luister aan ons Konvensie verleen.

Ek moet verskoning maak vir die luidsprekerstelsel, ek vertrou dat u my darem vanmiddag kon hoor, dit gaan darem baie beter die afgelope twee dae.

Dan wil ek graag iemand bedank, mnr. Tos Viljoen. Mnr. Tos Viljoen wat by die kantoor in my afwesigheid alles behartig het. Hy meld aan my dat hy alles gedoen het behalwe die tikwerk, daarvoor het hy nie kans gesien nie.

Aan die volgende personeellede my innige dank vir hulle hulp en ondersteuning gedurende die Konvensie:

Mnre. G. J. Gericke
J. N. A. Pretorius
J. E. Viljoen
D. M. Butze
F. V. White
J. L. van Wyk
J. S. Malan

Graag vra ek dan die lede van my personeel asook mnre. Willie de Bruin, Theunissen en Schultheiss van die Parke Departement om na vore te kom sodat ek aan hulle 'n klein geskenkie namens die VMEO kan oorhandig.

Dan wil ek ook graag in hulle afwesigheid mev. Kort bedank, sy het die blomme-rangskikkings gedoen, ek dink dit is pragtig, en ook by al die ander funksies waarby ons gewees het.

U weet dit seker nie maar mnr. Hough wat die Openingsrede gelewer het, was onlangs met 'n ernstige virus aandoening in die hospitaal, hy was ook veronderstel om vroeër in Parys te wees vir samesprekings met die Moeder-Maatskappy, wat seker vir ons in S.A. in die huidige buitelandse opset van baie waarde is. Hy het nog dieselfde middag na die opening vertrek na Parys. Ons opregte dank aan hom, sy Openingsrede het net die regte atmosfeer geskep vir hierdie Konvensie.

To the authors of the papers presented, our special thanks. The success of this Convention can be attributed to your efforts:

Messrs. J. L. Rothman, Peter Robinson, Wessel Barnard, Gerard Marloth, and Ken King.

Mr. Marloth we pray that your little daughter will recover completely.

To Ken king, my deputy, I want to express my sincere thanks. He has always been a pleasure to work with, an engineer of his calibre and stature. We in Roodepoort are very sorry that you have decided to return to Escom. Thanks for your consideration in delaying your resignation in order to see me through the Convention. Our best wishes accompany you in your new job.

Ladies and gentlemen, the success of this Convention must also be attributed to the excellent theatre evening we have had on the first night.

Our sincere thanks to:

Messrs. Hawker Siddeley Africa Transformers (Pty) Ltd.,
Hawker Siddeley Africa Switchgear (Pty) Ltd.,
African Cables Limited
ASEA Electric (S.A.) Limited
Bowmast (Pty) Limited
Chemilite (Pty) Limited
Crompton Parkinson (S.A.) (Pty) Limited
Farad (Pty) Limited
Heineman Electric (S.A.) Limited, and
S.A. Technical Industries.

Our thanks to Mr. Hampson who did most of the arrangements.

To the Transport Departments of Johannesburg City Council and Roodepoort for providing the transport our sincere thanks. Also to Mr. Barnard — Electricity Department, Johannesburg, who had a lot to do with the transport arrangements.

To Mrs. Glen Eyre of Victan Trust Translators, who provided the translation services, thank you very much for a most outstanding service.

My sincere thanks to Dennis Fraser, the President Elect, for his support and co-operation during the Convention.

En nou laaste maar nie die minste nie, die Randse Afrikaanse Universiteit. Die Ouditorium, die geriewe en die fasiliteite is uiters geskik vir 'n Konvensie van hierdie aard. Ons het dit geniet, maar dit was voorwaar 'n plesier om met die amptenare van die Universiteit te onderhandel in verband met die reëlings. Ek wil nie name noem nie, maar ek wil graag mnre. Jan Cronje en Botha by name noem. Ek moet ook mev. van der Westhuizen wat die etes verskaf het, bedank. Die reëlings was puik gewees.

Dit is egter ook so dat ons wat hier voor sit nie altyd kennis dra van persone wat miskien vir die laaste keer hierdie Konvensie bywoon en gevolglik sal ons bly wees indien u sal opstaan sodat ons kan totsiens sê en baie dankie vir die kameraadskap van die verlede en u goeie gesondheid kan toewens vir die toekoms : MR. TRAUTMANN.

I HEREBY DECLARE THE 46TH CONVENTION OF THE AMEU CLOSED AND THANK YOU FOR YOUR ATTENDANCE.

AMEU MEMBERSHIP ROLL — LEDELYS VMEO

HONORARY MEMBERS — ERELEDE

BARTON, R. W.: P.O. Box 708, Welkom, 9460.
BEESLEY, W.: Deputy City Electrical Engineer, P.O. Box 1803, Bulawayo.
BRADLEY, D. A.: 9 Target Kloof Road, Port Elizabeth, 6000.
DOWNIE, C. G.: 25 Rectory Gardens, Broadwater, Worthing, Sussex, England.
DOWNIE, J. C.: 10 Jessop Road, Selection Park, Springs, 1560.
EASTMAN, H. A.: "Woodlands Rise", 12 Woodlands Road, Somerset West, Cape, 7130.
EWING, R. G.: P.O. Box 779, East London, 5200.
FODEN, A.: 4 Hardy Road, Selborne, East London, 5200.
FRANTZ, A. C. T.: 7 New Way, Pinelands, Cape Town, 7405.
GILES, P. A.: P.O. Box 384, Pretoria, 0001.
HALLE, C. R.: 22 Connaught Road, Pietermaritzburg, 3201.
HUGO, H. J.: Maudstraat 110, Florida, 1710.
JAFFRAY, A. MORTON: 8 Fairbridge Avenue, Salisbury, Rhodesia.
KINSMAN, C.: 7 Highgate Place, Durban North, 4051.
KIPLING, H. G.: 49 St. James Street, East London, 5201.
LEISHMAN, R.: 66 Tana Road, Emmarentia Ext., Johannesburg, 2195.
LOMBARD, C.: Posbus 4181, Germiston-Suid, 1411.
MIDDLECOTE, A. A.: Private Bag X191, Pretoria, 0001.
MILTON, W. H.: 44 Halford Avenue, Waverley Ext., Johannesburg, 2192.
MITCHELL, J. E.: 1301 Grosvenor Court, Snell Parade, Durban, 4001.
MULLER, G. J.: Wilcockweg 35, Bloemfontein, 9301.
NOBBS, D. MURRAY: 7 Cambridge Part Court, Cambridge Park, Twinkenham TW1 2JN Middlesex, London, England.
PLOWDEN, D. C.: 11 Delta Road, Winston Ridge, 2196.
SIBSON, A. R.: P.O. Box 9074, Hillside, Rhodesia.
SIMPSON, R. M. O.: 71 Hunters Way, Umgeni Park, 4051.
SMITH, E. L.: 1 Ropley Ross Street, Amanzimtoti, 4125.
STEVENS, F.: 9 Apsley Court, 453 Musgrave Road, Durban, 4001.
STRASZACKER DR. R. L.: P.O. Box 1091, Johannesburg, 2000.
TELLES, J.: P.O. Box 1861, Lourenco Marques, P.E.A.
THERON, G. C.: Posbus 12088, Lumier, 1905.
TURNER, H. T.: Town Electrical Engineer, P.O. Box 121, Umtali, Rhodesia.
VAN DER WALT, J. L.: Posbus 1091, Johannesburg, 2000.
WADDY, J. C.: City Electrical Engineer, 27 Marshal Road, Athlone, Pietermaritzburg, 3201.

PAST MEMBERS — VOORMALIGE LEDE

ATTERBRIDGE, W. H.: P.O. Box 369, Port Elizabeth, 6000.
BARRIE, J. J.: 82 First Avenue, Dunvegan, Edenvale, 1610.
BURTON, C. R.: 54 Memorial Road, Kimberley, 8301.
CAMPBELL, A. R.: P.O. Box 3, Impendhele, 4545.
CLINTON, J. S.: P.O. Box 4648, Johannesburg, 2000.
COETZEE, E. J.: p/a Elektriese Meganiese Afdeling, Posbus 3, Vanderbijlpark, 1900.
CONRADIE, D. J. R.: Posbus 1009, Bloemfontein, 9300.
CRONJE, W. F.: Wenningstraat 37, Groenkloof, Pretoria, 0181.
DAWSON, C.: Electricity Supply Commission, P.O. Box 2408, Durban, 4000.
DREYER, H. C.: Chapellestraat 14, Courtrai, Paarl, 7646.
DUNSTAN, R. S.: P.O. Box 15024, Emerald Hill, Port Elizabeth, 6001.
ERIKSON, J. G. F.: P.O. Box 24, Margate, Natal, 4275.
FORD, W. P.: 16 Abrey Road, Kloof, 3600.
HARVEY, A. Q.: 71 Garden Street, Redhouse, Port Elizabeth, 6001.
HEASMAN, G. G.: P.O. Box 77, Fort Victoria, Rhodesia.
HESS, I.: Blackwood, Upper Mountain Road, Somerset West, 7130.
LIEBENBERG, S. J.: Posbus 98, Pretoria, 0001.
LYNCH, E. C.: P.O. Box 73, Salisbury, Rhodesia.
MAGOWAN, J. M.: S.R. Electricity Supply Commission, P.O. Box 377, Salisbury, Rhodesia.
MATHEWS, J. A.: c/o De Beers Consolidated Mines Ltd., P.O. Box 616, Kimberley, 8300.
McGIBSON, J.: P.O. Box 164, Carletonville, 2500.
MOLE, E. W.: P.O. Box 39663, Bramley, 2018.
McWILLIAM, E. A.: 202 Nicholson Street, Brooklyn, Pretoria, 0181.
MULLER, H. M. S.: 1 Neser Street, Graaff-Reinet, 6280.
POTGIETER, N. A.: Webbstraat 1211, Queenswood, Pretoria, 0186.
PSOTTA, K. U.: Malherbestraat 9, Upington, 8800.
REICHERT, W. J.: p/a Universiteitsingenieur, Universiteit van Kaapstad, Privaatsak, Rondebosch, 7700.
ROSSLER, A.: 3 Greenwood Road, Pietermaritzburg, 3201.
THERON, W. C.: Rouxweg 19, Worcester, 6850.
WILLIAMS, J. T.: P.O. Box 1617, Pretoria, 0001.
WYLIE, R. J. S.: P.O. Box 217, Germiston, 1400.

ENGINEER MEMBERS — INGENIEURSLEDE

A

ADAMS, C. E.: City Electrical Engineer, P.O. Box 369, Port Elizabeth, 6000.

B

BAILEY, R. V.: Borough and Electrical Engineer, P.O. Box 72, Stanger, 4450.
BAKER, A. B.: Electrical Engineer, P.O. Box 20, Swellendam, 6740.
BAMBER, F. W.: City Electrical Engineer, P.O. Box 1803, Bulawayo, Rhodesia.
BARNARD, P. J.: Elektrotegniese Ingenieur, Posbus 6, Delmas, 2210.
BARNARD, W.: City Electrical Engineer, P.O. Box 699, Johannesburg, 2000.
BEARD, G. R.: Town Electrical Engineer, P.O. Box 176, Grahamstown, 6140.
BERHARDIJ, L.:
BLEACH, R. L.: Town Electrical Engineer, Empangeni, 3880.
BOBEK, K. H.: Borough Engineer, P.O. Box 37, Eshowe, 3815.
BOOYSENS, L.: Elektrotegniese Ingenieur, Posbus 155, Vrede, 2455.
BOSHOFF, T. L.: Electricity Department, Civic Centre, Oudtshoorn, 6620.
BOTES, P. J.: Elektrotegniese Ingenieur, Posbus 217, Roodepoort, 1725.
BOTHA, N. S.: Town Electrical Engineer, P.O. Box 288, Bloemfontein, 9300.
BOTHMA, O.: Engineer in Charge, P.O. Box 25, Mosselbay, 6500.
BOYACK, I. F.: City Electrical Engineer, P.O. Box 423, Pretoria, 0001.
BOZYCZKO, W.: P.O. Box 15, Estcourt, 3310.

BRIERS, D. B.: Elektrotegniese Ingenieur, Posbus 302, Kroonstad, 9500.
BRINK, P. S. J.: Town Electrical Engineer, P.O. Box 20, Hermanus, 7200.
BRUMMER, J. G.: Elektrotegniese Ingenieur, Posbus 17, Stellenbosch, 7600.

C

CLARKE, M. M. P.: City Electrical Engineer, Private Bag 1, Randburg, 2125.
CLOETE, J.: Chief Electrical Engineer, P.O. Box 44, Ceres, 6835.
CLOETE, D. J.: Posbus 42, Despatch, 6230.

D

DAVIES, E. G.: City Electrical Engineer, P.O. Box 399, Pietermaritzburg, 3200.
DAWSON, J. D.: Municipal Electrical Engineer, P.O. Box 45, Uitenhage, 6230.
DE BRUIN, H. J.: Elektrotegniese Stadsingenieur, Posbus 218, Randfontein, 1760.
DERNIER, W.: Electrical Engineer, P.O. Box 206, Aliwal North, 5530.
DE VILLIERS, E. E.: Elektrotegniese Ingenieur, Posbus 16, Rustenburg, 0300.
DE WET, N. B.: Posbus 35, Vereeniging, 1930.
DE WET, L. D. M.: Pr. Ing. Stads-Elektrotegniese Ingenieur, Posbus 15, Brakpan, 1540.
DREYER, L.: Elektrotegniese Ingenieur, Posbus 19, Westonaria, 1780.
DU PLESSIS, C. P.: Elektrotegniese Ingenieur, Posbus 37, Worcester, 6850.

E

EHRICH, J. A.: Town Electrical Engineer, P.O. Box 66, Standerton, 2430.

F

FORTMANN, A. H. L.: Town Electrical Engineer, P.O. Box 215, Boksburg, 1460.
FRASER, D. H.: City Electrical Engineer, P.O. Box 147, Durban, 4000.
FUTCHER, L.: Municipal Electrical Engineer, P.O. Box 13, Kempton Park, 1620.

G

GAMBLE, J. S.: Borough Engineer, P.O. Box 76, Dundee, 3000.
GERTENBACH, J. J.: Elektrotegniese Stadsingenieur, Posbus 17, Upington, 8800.
GREYLING, J. P. J.: Elektrotegniese Stadsingenieur, Posbus 111, Pietersburg, 0700.
GROBLER, J.: Elektrotegniese Stadsingenieur, Posbus 551, Bethlehem, 9700.

H

HAIG-SMITH, D.: Town Electrical Engineer, P.O. Box 113, Queenstown, 5320.
HALLIDAY, K. W. J.: Municipal Electrical Engineer, P.O. Box 5, Port Shepstone, 4240.
HAMMERSCHLAG, S. N.: Town Electrical Engineer, P.O. Box 3, Bedfordview, 2008.
HEYDENRYCH, J. E.: Elektrotegniese Ingenieur, Posbus 14, Middelburg, Tvl. 1050.
HUGO, A. H. W.: Town Electrical Engineer, P.O. Box 78001, Sandton, 2146.
HUGO, J. G.: Electrical Engineer, P.O. Box 51, Bredasdorp, 7280.
HUYSAMEN, G.A.:

J

Jontzen, G. H.: Posbus 24, Clocolan, 9735.

K

KOESLAG, H. J.: Elektrotegniese Ingenieur, Posbus 52, Robertson, 6705.
KRUGER, M. J. C.: Elektrotegniese Ingenieur, Posbus 13, Port Alfred, 6170.

L

LABUSCHAGNE, J. J.: Elektrotegniese Stadsingenieur, Posbus 86, Walvisbaai, SWA, 9190.
LE ROUX, D. F.: Elektrotegniese Ingenieur, Posbus 36, Duiwelskloof, 0835.
LEWIS, L.: Town Electrical Engineer, P.O. Box 59, Windhoek, SWA, 9100.
LOCHNER, J. van S.: Elektrotegniese Ingenieur, Posbus 106, Brits, 0250.
LOTTER, G. A.: Elektrotegniese Ingenieur, Posbus 34, Potgietersrust, 0600.
LOUBSER, J. A.: Elektrotegniese Ingenieur, Posbus 1014, Benoni, 1500.
LOUW, H. A. L.: Elektrotegniese Stadsingenieur, Posbus 12, Paarl, 7620.

M

MALAN, J. G.: Elektrotegniese en Meganiese Ingenieur, Posbus 13, Kempton Park, 1620.
McMILLAN, K. H. D.: Electrical Engineer, P.O. Box 47, Umtata, 5100.
McNEIL, J. L.: Town Electrical Engineer, P.O. Box 8, Kokstad, E. Griqualand, 4700.
MILLEN, T. J.: Town and Electrical Engineer, P.O. Box 24, Tzaneen, 0850.
MOSTERT, S. A.: Elektrotegniese Ingenieur, Posbus 19, George, 6530.
MURPHY, K. J.: Municipal Electrical Engineer, P.O. Box 19, Somerset West, 7130.

N

NORTJE, G. J.: Elektrotegniese Stadsingenieur, Posbus 145, Germiston, 1400.

O

ODENDAAL, M. W.: Elektrotegniese Stadsingenieur, Posbus 4, Alberton, 1450.

P

PALSER, D. C.: City Electrical Engineer, P.O. Box 82, Cape Town, 8000.
PETERS, A. G.: Town Electrical Engineer, P.O. Box 278, Gwelo, Rhodesia.
PIKE, E. B.:
PIVA, J. H.: Principal Engineer, Amatola Row No. 73, Kingwilliamstown, 5600.
POTGIETER, D. E. T.: Elektrotegniese Stadsingenieur, Posbus 14103, Verwoerdburg, 0140.
PRETORIUS, E. de C.: Elektrotegniese Stadsingenieur, Posbus 113, Potchefstroom, 2520.
PRETORIUS, J. W.: Assistent-Elektrotegniese Ingenieur, Posbus 23, Nigel, 1490.
PURDON, D.: Town Electrical Engineer, P.O. Box 67, Phalaborwa, 1390.

R

RATTEY, W. P.: Electrical Engineer, P.O. Box 3, Strand, 7140.
ROBSON, K. G.: City Electrical Engineer, P.O. Box 529, East London, 5200.
RUSH, W. G.: Town Electrical Engineer, P.O. Box 76, Dundee, 3000.

S

SCHREUDER, T. P.: Posbus 98, Vredendal, 8160.
STRAUSS, J. C.: Elektrotegniese Ingenieur, Posbus 60, Sasolburg, 9570.

T

TE BRUGGE, E. J.: Elektrotegniese Ingenieur, Posbus 7, Lichtenburg, 2740.
TEN GATE, J.: Elektrotegniese Ingenieur, Posbus 7, Lichtenburg, 2740.
TRAUTMANN, E. P. E. W.: Electrical Engineer, P.O. Box 29, Ladysmith, 3370.
TURNBULL, A. F.: Town Electrical Engineer, P.O. Box 35, Vereniging, 1930.

V

VAN DEN BERG, A. J.: Elektrotegniese Ingenieur, Posbus 94, Krugersdorp, 1740.
VAN DER MERWE, D. S.: Elektrotegniese Ingenieur, Posbus 3, Witbank, 1035.
VAN DER MERWE, F. J.: Elektrotegniese Ingenieur, Posbus 3, Carletonville, 2500.
VAN HEERDEN, W. J. B.: Elektrotegniese Ingenieur, Posbus 201, Heidelberg, 2400.
VAN MEERDERVORT, J. K. L.: Elektrotegniese Ingenieur, Posbus 33, Barberton, 1300.

VAN TONDER, C. J.: Elektrotegniese en Werktuigkundige Ingenieur, Posbus 21, Odendaalsrus, 9480.
VAN WYK, A. A.: Elektrotegniese Ingenieur, Posbus 45, Nelspruit, 1200.
VELDSMAN, D. E.: Elektrotegniese Ingenieur, Posbus 57, Vryheid, 3100.
VENTER, G. A.: Elektrotegniese Ingenieur, Posbus 9, Meyerton, 1960.
VON AHLFTEN, J. K.: Elektrotegniese Ingenieur, Posbus 45, Springs, 1560.
VOSLOO, C.: Posbus 628, Kimberley, 8300.

ASSOCIATES — ASSOSIATE

B

BECK, H. D.: Deputy City Electrical Engineer, P.O. Box 529, East London, 5200.
BOSHOFF, J. J.: Elektrotegniese Ingenieur, Posbus 3, Vanderbijlpark, 1900.
BRINK, H. J.: Groepingenieur, Posbus 288, Bloemfontein, 9300.

C

CARTER, C. T.: Assistant City Electrical Engineer, P.O. Box 82, Cape Town, 8000.

D

DE VILLIERS, A. S.: Electrical Engineer, 44 Wale Street, Cape Town, 8001.
DE VRIES, G. S.: Groepingenieur-Verspreiding, Posbus 1079, Bloemfontein, 9300.
DE BEER, W. H.: Adjunk-Elektroniese Stadsingenieur, Posbus 48, Warmbad, 0480.
DELPORT, J. L. F. H.: Adjunk-Elektroniese Stadsingenieur, Posbus 25, Edenvale, 1610.
DU PLESSIS, C. J.: Posbus 868, Kempton Park, 1620.
DU PLESSIS, G. C.: Adjunk-Elektrotegniese Stadsingenieur, Posbus 94, Krugeerrsdddoorph, .1740.
DU TOIT, R. E.: Posbus 2694, Witbank, 1035.

H

HILL, D. R.: City Electricity Department, P.O. Box 147, Durban, 4000.

L

LAMPRRECHT, B. C.: Privaatsak X014, Benoni, 1500.
LEIGH, R. A.: Deputy City Electrical Engineer, P.O. Box 699, Johannesburg, 2000.

M

McINTYRE, H. A.: Town Electrical Engineer, P.O. Box 35, Vereeniging, 1930.

O

OPPERMAN, D. J.: Elektrotegniese Ingenieur, Posbus 45, Springs, 1560.

P

POLLOCK, T.: Electrical Engineer, P.O. Box 3, Gordon's Bay, 7150.

R

RAUTENBACH, G. F.: Elektrotegniese Ingenieur, Posbus 99, Klekrsdorp, 2570.
RHEEDER, R. J. B.: Posbus 41, Cathcart, 5310.

S

SCHOLES, E. H.: Deputy City Electrical Engineer, P.O. Box 699, Johannesburg, 2000.
SMITH, A. M.: Principal Engineer (Distribution), P.O. Box 369, Port Elizabeth, 6000.
STEENKAMP, P. J.: Assistant-Elektrotegniese Stadsingenieur, Posbus 14013, Verwoerdburg, 0140.
SURTHEES, E. H.: Deputy Town Engineer, P.O. Box 215, Boksburg, 1460.

V

VAN DER WALT, C. J.: Privaatsak X014, Benoni, 1500.
VAN SCHALKWYK, A. P.: Assistent-Elektrotegniese Stadsingenieur, Posbus 288, Bloemfontein, 9300.

ASSOCIATE MEMBERS — ASSOSIAATLEDE

B

BEKKER, M. J.: Elektrotegniese Ingenieur, Posbus 96, Louis Trichardt, 0920.
BOSCH, D. M.: Elektrotegniese Ingenieur, Posbus 21, Tarkastad, 5370.
BOTHA, A.: Hoof van Elektriese Afdeling, Posbus 6, Delmas, 2210.
BUISSET, J. A.: Elektrotegniese Ingenieur, Posbus 34, Orkney, 2620.

C

CLAXTON, H. D.: Electrical Engineer, P.O. Box 71, Graaff-Reinet, 6280.
COOPER-CHADWICK, C.: P.O. Box 57, Germiston, 1400.

D

DAUTH, W. J.: Chief Electrical Engineer, P.O. Box 48, Volksrust, 2470.
DE BRUYN, C. D.: Elektrotegniese Stadsingenieur, Posbus 15, Willowmore, 6680.
DU TOIT, A. J.: Elektrotegniese Ingenieur, Posbus 37, Viljoenskroon, 9520.
DU TOIT, E.: Elektrotegniese Ingenieur, Posbus 52, Robertson, 6705.

F

FLETCHER, J. L.: Deputy City Electrical Engineer, P.O. Box 147, Durban, 4000.

G

GOUSSARD, P. J.: Hoofelektrisiën, Posbus 14, Koppies, 9540.
GOWIE, E.: Electrical Foreman, P.O. Box 35, Matatiele, East Griqualand, 4730.
GREYLING, B. C. B.: Electrical Engineer, P.O. Box 48, Ermelo, 2350.
GROVE, C. R.: Hoofelektrisiën, Posbus 43, Harrismith, 9880.
GREYLING, A. J.: Senior Tegniese Beampte, Privaatsak X2016, Standerton, 2430.
GROTIUS, R. J.: Posbus 13, Dewetsdorp, 9940.

H

HARPESTAD, P.: P.O. Box 21, Knysna, 6570.
HOBBES, J. L.: P.O. Box 45, Uitenhage, 6230.

J

JANSE VAN RENSBURG, W. W.: Posbus 14064, Benoni, 1500.
JELLIMAN, C. E.: P.O. Box 36, Fort Beaufort, 5720.
JORDAAN, P. W.: Hoof van Elektrotegniese Afdeling, Posbus 34, Potgietersrus, 0600.

K

KOBUS, E. E.: Senior Elektrisiën, Posbus 5, Postmasburg, 8420.
KOK, J. A.: Waarnemende Elektrotegniese Ingenieur, Posbus 55, Middelburg, KP., 5900.
KREBS, W. F.: Privaatsak 2209, Otjiwarongo, 9210.

L

LAAS, C. P.: Elektrotegniese Ingenieur, Posbus 15, Kenhardt, 8900.

M

MARAIS, J. S.: Posbus 10, Carnarvon, 7060.
McNAMARA, A. B.: Electrical Engineer, P.O. Box 21, Komga, 4950.
MULDER, J. A. C.: Posbus 60, Piketberg, 7320.
MYBURGH, G.: Elektrotegniese Ingenieur, Posbus 4, Kuruman, 8460.
MOSTERT, A. H.: Posbus 53, Swakopmund, SWA., 9180.

N

NEL, J. T. F.: Elektrotegniese Stadsingenieur, Posbus 33, King Williamstown, 5600.

P

PAGEL, P. V. E.: Elektrotegniese Ingenieur, Munisipaliteit, Plettenbergbaai, 6600.
PEENS, J. G.: Dorpsingenieur, Posbus 24, Carolina, 1185.
PRETORIUS, P. J. R.: Elektrotegniese Stadsingenieur, Posbus 35, Vryburg, 8600.

S

SMALL, C. T. R.: Town Electrical Engineer, P.O. Box 9, Beaufort West, 6970.
SMITH, F. H.: Electrical Engineer, P.O. Box 42, Despatch, 6220.
SWART, T. L.: Elektrotegniese Ingenieur, Posbus 10, Glencoe, 2930.

V

VAN DER SCHYFF, G. W.: Stadsingenieur, Posbus 3, Bethal, 2031.
VAN ROOYEN, H. E.: Dorps- Waterwerke en Elektrotegniese Ingenieur, Munisipaliteit, Kirkwood, 6120.
VENTER, J. A.: P.O. Box 82, Cape Town, 8000.
VIDLER, J. A.: P.O. Box 21, Jeffreys Bay, 6330.

W

WHEELER, D. J.: Posbus 13, Burgersdorp, 5520.

LOCAL AUTHORITIES — PLAASLIKE BESTURE

A

Adelaide, CP.
Alberton, Tvl.
Aliwal North, CP.

B

Barberton, Tvl.
Benoni, Tvl.
Bloemfontein, OVS.
Brakpan, Tvl.
Burgersdorp, KP.
Beaufort-Wes, KP.
Bethal, Tvl.
Boksburg, Tvl.
Bredasdorp, KP.
Bantoesake-Administrasieraad, Suid-Transvaal.
Bedfordview Village Council, Tvl.
Bethlehem, OVS.
Bothaville, OVS.
Brits, Tvl.
Bantoesake-Administrasieraad, Hoëveldgebied.
Bantoesake-Administrasieraad, Sentraal Transvaal.

C

Cape Town
Carolina, Tvl.
Carletonville, Tvl.
Cathcart
Ceres, KP.
Carnarvon, KP.
Cradock, KP.

D

De Aar, KP.
Duiwelskloof, Tvl.
Delmas, Tvl.
Dundee, Natal.
Dewetsdorp, OVS.
Durban.

E

East London, CP.
Ermelo, Tvl.
Evander, Tvl.
Edenvale, Tvl.
Eshowe, Natal.
Empangeni, Natal.
Escourt, Natal.

F

Fochville, Tvl.
Fort Beaufort, CP.

G

George, CP.
Gobabis, SWA.
Grahamstown, CP.
Germiston, Tvl.
Gordonsbay, CP.
Greytown, Natal.
Glencoe, Natal.
Graaff-Reinet, CP.

H

Heidelberg, Tvl.
Henneman, OVS.
Hermanus, CP.
Howick, Natal.

J

Johannesburg
Jeffreysbaai, KP.

K

Kakamas, KP.
Kenhardt, KP.
Kirkwood, KP.
Kokstad, Oos-Griekwaland
Kroonstad, OVS.
Keetmanshoop, SWA.
Kimberley, KP.
Klerksdorp, Tvl.
Komgha, CP.
Krugersdorp, Tvl.
Kempton Park, Tvl.
King Williamstown, CP.
Knysna, KP.
Koppies, OVS.
Kuruman, KP.

L

Ladybrand, OVS.
Louis Trichardt, Tvl.
Ladysmith, Natal.
Lydenburg, Tvl.
Lichtenburg, Tvl.

M

Mafeking, KP.
Meyerton, Tvl.
Mooi River, Natal
Matatiele, Oos-Griekwaland.
Middelburg, Tvl.
Mosselbaai, KP.
Middelburg, KP.

N

Nelspruit, Tvl.
Newcastle, Natal
Nigel, Tvl.

O

Odendaalsrus, OVS.
Orkney, Tvl.
Oos-Randse Bantoesake-Administrasieraad
Otjiwarongo, SWA.

P

Paarl, KP.
Pietermaritzburg, Natal.
Plettenbergbaai, KP.
Port Shepstone, Natal.
Potgietersrus, Tvl.
Peri-Urban Areas Health Board, Pretoria, Tvl.
Parys, OVS.
Pietersburg, Tvl.
Port Alfred, CP.
Postmasburg, KP.
Pretoria, Tvl.
Phalaborwa, Tvl.
Piet Retief, Tvl.
Piketberg
Port Elizabeth, CP.
Potchefstroom, Tvl.

Q

Queenstown, CP.

R

Randburg
Randfontein, Tvl.
Robertson, CP.
Richardsbaai, Natal.
Roodepoort, Tvl.
Riversdale, CP.
Rustenburg, Tvl.

S

Sandton, Tvl.
Somerset West, CP.
Stanger, Natal.
Strand, KP.
Sasolburg, Tvl.
Springs, Tvl.
Stellenbosch, KP.
Swakopmund, SWA.
Somerset East, CP.
Standerton, Tvl.
Swellendam.

T

The Divisional Council of the Cape.
Tarkastad, KP.
Thabaszimbi, Tvl.
Tzaneen, Tvl.

U

Uitenhage, CP.
Umtata, Transkei.
Upington, CP.

V

Vanderbijlpark, Tvl.
Viljoenskroon, OVS.
Vredenburg-Saldanha, CP.
Vereeniging, Tvl.
Virginia, OVS.
Vryburg, KP.
Verwoerdburg, Tvl.
Volksrust, Tvl.
Vryheid, Natal.
Vredendal.

W

Walvisbay, SWA.
Wellington, KP.
Westonaria, Tvl.
Witbank, Tvl.
Worcester, KP.
Warmbad, Tvl.
Wes-Randse Bantoesake-Administrasieraad, Tvl.
Winburg, OVS.
Witrivier, Tvl.
Welkom, OVS.
Windhoek, SWA.
Wolmaransstad, Tvl.

AFFILIATE MEMBERS — GEAFFILIEERDE LEDE

A

AECI Ltd: P.O. Box 1122, Johannesburg, 2000. Tel. 21-4651.
A.E.G. Telefunken (Pty) Ltd: P.O. Box 10264, Johannesburg, 2000.
Ash Brothers (Pty) Ltd: P.O. Box 6061, Johannesburg, 2000. Tel. 834-3751.
ATW Electrical (Pty) Ltd: P.O. Box 2873, Johannesburg, 2000. Tel. 836-0501.
Aberdare Cables Africa Ltd: P.O. Box 494, Port Elizabeth, 6000. Tel. 53-1318.
Adams Ripley & Durr: P.O. Box 31126, Braamfontein, 2017. Tel. 724-3565.
African Cables Limited: P.O. Box 172, Vereeniging, 1930. Tel. 4-2021.
Allenwest-GE Sales (Pty) Ltd: P.O. Box 6168, Johannesburg, 2000. Tel. 833-7400.
Allied Electric (Pty) Ltd: P.O. Box 6090, Dunswart, 1508.
Alusaf: P.O. Box 284, Empangeni, 3880. Tel. 5-111 (Richards Bay)
Anode Electrical Engineering & Construction Co. (Pty) Ltd: P.O. Box 673, Brakpan, 1540. Tel. 55-6211.
Asea Electric (Pty) Ltd: P.O. Box Box 691, Pretoria, 0001. Tel. 79-7020.
Aycliffe Cables Ltd: P.O. Box 5244, Johannesburg, 2000. Tel. 609-4020.
Asea Reunert (Pty) Ltd: P.O. Box 157, Bedfordview, 2008. Tel. 53-8614.
Avon Wire (Pty) Ltd: P.O. Box 162, Randfontein, 1760. Tel. 663-3645.

B

Ballenden & Robb: P.O. Box 4648, Johannesburg, 2000. Tel. 22-6971.
Brian Colquhoun, O'Donnel & Partners (Pty) Ltd: P.O. Box 31757, Braamfontein, 2017. Tel. 39-4376.
British Ins. Callender's Cables of S.A. Ltd: P.O. Box 2827, Johannesburg, 2000. Tel. 24-0181.
Brown Boveri Orsal (Pty): P.O. Box 10966, Johannesburg, 2000. Tel. 618-2700.
Brown Boveri South Africa (Pty) Ltd: P.O. Box 1500, Johannesburg, 2000. Tel. 836-5791.

C

Cahi Gertenbach, Vorster en De Vries: Posbus 1079, Bloemfontein, 9300. Tel. 78081.
Chemilite (Pty) Ltd: P.O. Box 25720, Denver, 2027. Tel. 616-1313.
Chloride Elect. Storage Co. of S.A. Limited: P.O. Box 39264, Bramley, 2018. Tel. 45-2216.
Cibe-Geigy (Pty) Ltd: P.O. Box 92, Isando, 1600. Tel. 975-9830.
Clinkscales Maughan Brown & Partners: P.O. Box 196, Port Elizabeth, 6000. Tel. 2-9779.
Clinkscales Maughan Brown & Partners: P.O. Box 570, Cape Town, 8001.
Complete Cabling Equipment (Pty) Limited: P.O. Box 107, Mondeor, 2110. Tel. 830-7029.
Conradie D. J. J. & Vennote: Posbus 17031, Groenkloof, Pretoria, 0001. Tel. 3-1755.
Crompton Parkinson S.A.(Pty) Ltd: P.O. Box 4236, Johannesburg, 2000. Tel. 680-3400.
Cu Al Engineering (Pty) Ltd: P.O. Box 228, Delbridge, Natal, 4014. Tel. 35-7177.
Cutler-Hammer (S.A.) Ltd: P.O. Box 14089, Wadeville, 1422. Tel. 34-9124.

D

Disbar (Pty) Ltd: P.O. Box 38228, Booysens, 2016. Tel. 838-7319.
Drewett, Ian & Partners: P.O. Box 35, Johannesburg, 2000. Tel. 834-5381.
Dulminson Performed Line Products S.A. (Pty) Ltd: 180 Ortman Road, Pietermaritzburg, 3201. Tel. 23344.
Du Toit C. A. & Partners: P.O. Box 4256, Pretoria, 0001. Tel. 38-991.
Du Toit C. A. & Vennote (Suid): Posbus 6089, Kaapstad, 8012. Tel. 26-541.
Duropenta (Tvl.) (Pty) Ltd: P.O. Box 389, Germiston, 1400. Tel. 34-9241.

E

Eberhardt-Martin (Pty) Ltd: P.O. Box 85027, Emmarentia, 2029. Tel. 46-2176.
Egatube Plastic Conduits (Pty) Ltd: P.O. Box 140, Rosslyn, Pretoria, 0001. Tel. 58-2238.
Electrical Contractors Association of S.A.: P.O. Box 5327, Johannesburg, 2000. Tel. 834-1087.
Electrical Protection Co. (Pty) Ltd: P.O. Box 570, Benoni, 1500. Tel. 54-8123.
Electrical Engineering (Pty) Ltd: P.O. Box 27129, Benrose, 2011. Tel. 24-6173.
Emag Electrical Engineering (Pty) Ltd: P.O. Box 27129, Benrose, 2011. Tel. 680-8263.
Everitt, Germishuizen & Vennote: Posbus 4083, Johannesburg, 2000. Tel. 22-2541.
Electro Engineering (Pty) Ltd: P.O. Box 6709, Johannesburg, 2000. Tel 42-9455.

F

Fulmen Africa (Pty) Ltd: P.O. Box 8023, Elandsfontein, 1406. Tel. 36-5201.
Farad (Pty) Limited: P.O. Box 31220, Braamfontein, 2017. Tel. 41-4446.
Fuchs Electrical Ind. (Pty) Ltd: P.O. Box 3758, Alrode, 1451. Tel. 864-1800.
Fuji Appliances S.A. (Pty) Ltd: P.O. Box 553, Pinetown, 3600. Tel. 84-7434.

G

Gardner, D. A.: Consulting Engineers, 278 Oxford Street, East London, 5201.
Gawlowski, De Villiers & Partners: P.O. Box 2168, Cape Town, 8000. Tel. 2-7454.
GEC Electrical Products (Pty) Ltd: Private Bag 1, Bramley, 2018. Tel. 869-5261.
GEC Power Distribution Limited: P.O. Box 13024, Knights, 1413. Tel. 826-3536.

Globe Electrical (Cape) (Pty) Ltd: P.O. Box 152, Salt River, 7925. Tel. 47-4570.
Golnix (Pty) Ltd: P.O. Box 2512, Cape Town, 8000. Tel. 29-454.

H

Hawker-Siddeley Africa Switchgear (Pty) Ltd: P.O. Box 31053, Braamfontein, 2017. Tel. 39-1911.
Hawker-Siddeley Africa Transformers (Pty) Limited: P.O. Box 426, Kempton Park, 1620. Tel. 975-0340.
H. D. Symons Manufacturing (Pty) Ltd: P.O. Box 63, Roodepoort, 1725. Tel. 763-5457.
Heineman Electric S.A. Limited: P.O. Box 881, Johannesburg, 2000. Tel. 36-7033.
Hill, Kaplan, Scott & Partners: P.O. Box 17321, Hillbrow, 2038. Tel. 642-4791.
Hulletts Aluminium Limited: P.O. Box 25, Olifantsfontein, 1665. Tel. 61-2201.
Hubert Davies Electrical Engineering (Pty) Ltd: P.O. Box 8077, Elandsfontein, 1406.

I

Industrial Machinery Supplies (Pty) Ltd: P.O. Box 9653, Johannesburg, 2000.

J

Jackson A.: P.O. Box 9181, Johannesburg, 2000. Tel. 43-0430.

K

Kilpatrick S.A. (Pty) Limited: P.O. Box 6869, Johannesburg, 2000. Tel. 2-9383.
Klockner-Moeller (S.A.) (Pty) Ltd: P.O. Box 100, Kempton Park, 1620. Tel. 975-3937.

L

Lascon Lighting Industries (Pty) Ltd: P.O. Box 7125, Johannesburg, 2000. Tel. 839-2341.
Litemaster Products Ltd: P.O. Box 8973, Johannesburg, 2000. Tel. 22-7544.

M

Marais G. H. & Vennote: Posbus 1789, Pretoria, 0001. Tel. 31-681.
Marthinusen & Coutts (Pty) Ltd: P.O. Box 469, Johannesburg, 2000. Tel. 25-8167.
Marthinusen L. H. Limited: P.O. Box 25664, Denver, 2027. Tel. 25-8961.
Meissner H. G. & Co. (Pty) Ltd: P.O. Box 10867, Johannesburg, 2000. Tel. 838-4714.
Merz & McLellan: P.O. Box 31012, Braamfontein, 2017. Tel. 724-3421.
Metal Rolling & Tube Co.: P.O. Box 39045, Bramley, 2018. Tel. 40-6831.
Midland Equipment (Pty) Ltd: P.O. Box 440, Kempton Park, 1620. Tel. 975-5941.

N

North & Robertson (Pty) Ltd: P.O. Box 300, East London, 5200. Tel. 23-387.
N.K.F. Groep: P.O. Box 8514, Johannesburg, 2000. Tel. 53-1318.

O

Ogatin (Pty) Limited: P.O. Box 514, Roodepoort, 1725. Tel. 21-7758.
Ove Arup & Partners Consulting Engineers: P.O. Box 52285, Saxonwold, 2132. Tel. 42-6624.

P

Pirelli General Cables (S.A.) (Pty) Ltd: P.O. Box 605, Florida, 1710. Tel. 672-5368/9.
Phosware (Pty) Limited: P.O. Box 391, Springs, 1560. Tel. 818-5811.
Power Engineers (Pty) Ltd: P.O. Box 44, Eppindust, 7475.
Power Lines (Pty) Ltd: P.O. Box 1989, Johannesburg, 2000. Tel. 725-5350.

R

Raychem (Pty) Limited: P.O. Box 134, Olifantsfontein, Pretoria, 1665. Tel. 61-1628.
Republic Power & Communication Co. (Pty) Limited: P.O. Box 5440, Johannesburg, 2000. Tel. 786-2370.
Reunert & Lenz Limited: P.O. Box 92, Johannesburg, 2000. Tel. 836-1351.
Reyrolle & Co. Limited: P.O. Box 1975, Salisbury, Rhodesia.
Reyrolle Parons of S.A. (Pty) Limited: P.O. Box 8080, Elandsfontein, 1406. Tel. 36-2866.
Rogers G. S. (Pty) Limited: P.O. Box 27169, Benrose, 2011. Tel. 24-8134.

S

S.A. National Committee on Illumination: P.O. Box 395, Pretoria, 0001. Tel. 79-7010.
S.A. Philips (Pty) Limited: P.O. Box 7703, Johannesburg, 2000. Tel. 24-8121.
S.A.T.I. (Edms) Beperk: Posbus 561, Silverton, 0127. Tel. 83-2281.
Scottish Cables S.A. Limited: P.O. Box 2882, Johannesburg, 2000. Tel. 25-8381.
Siemens S.A. (Pty) Limited: P.O. Box 4583, Johannesburg, 2000. Tel. 725-3014.
Sigmaform S.A. (Pty) Limited: P.O. Box 51319, Randburg, 2125. Tel. 46-5342.
S.A. General Electric Co. (Pty) Ltd: P.O. Box 5032, Benoni South, 1500. Tel. 52-8111.
Sentrachem Limited: P.O. Box 61204, Marshalltown, 2107. Tel. 836-8911.
Simplex-GE Lighting (Pty) Limited: P.O. Box 61067, Marshalltown, 2107. Tel. 838-7969.
S.M.E. Lighting Protection & Earthing Division (Pty) Limited: P.O. Box 3310, Johannesburg, 2000. Tel. 833-1960.
Stiebel Eltron (Pty) Ltd: 189 D. F. Malan Drive, Northcliff, 2195. Tel. 46-2041.
Stone Platt Electrical (Stamcor) (Pty) Limited: P.O. Box 50292, Randburg, 2125. Tel. 48-1150.
Sulzer Bros. S.A. Limited: P.O. Box 930, Johannesburg, 2000. Tel. 618-4125.
Square D (Pty) Ltd: P.O. Box 4212, Luipaardsvlei, 1743.

T

Thorn Lighting S.A. (Pty) Limited: P.O. Box 43075, Industria, 2042. Tel. 839-2434.
3M South Africa (Pty) Limited: P.O. Box 10465, Johannesburg, 2000. Tel. 36-3211.
Tubemakers of S.A. Ltd: P.O. Box 20129, Peace Haven, 1934. Tel. 825-1110.

U

Uniplan (Pty) Limited: P.O. Box 7259, Johannesburg, 2000. Tel. 22-8971.
Usco Cable Co. (Pty) Limited: P.O. Box 48, Vereeniging, 1930. Tel. 4-5122.
Usko Aluminiumkorporasie (Edms) Bpk: Posbus 7, Richardsbaai, 2900. Tel. 5200.

V

Vaja Products (Pty) Limited: P.O. Box 35247, Northcliff, 2115. Tel. 678-1614.
J. D. van Niekerk en Genote Ing: Posbus 50645, Randburg, 2125. Tel. 46-5353.
Vetisa (Pty) Ltd: P.O. Box 15783, Pretoria, 0001.

W

Waco Distributors: P.O. Box 461, Johannesburg, 2000. Tel. 21-7811.
Wardle & Simpson: P.O. Box 15079, Port Elizabeth, 6000.
Weyers Aab & Hubeé: P.O. Box 174, Pretoria, 0001. Tel. 2-0921.

Y

Yorkshire Switchgear S.A. (Pty) Ltd: P.O. Box 157, Pinetown, 1600. Tel. 72-1501.

PAST PRESIDENTS/VOORMALIGE PRESIDENTE

1915—17	* J. H. Dobson	Johannesburg
1917—19	* J. Roberts	Durban
1919—20	* B. Sankey	Port Elizabeth
1920—22	* T. C. W. Dodd	Preotria
1922—24	* G. H. Swingler	Cape Town
1924—26	* J. Roberts	Durban
1926—27	* B. Sankey	Johannesburg
1927—29	* J. M. Lambe	East London
1929—31	* R. Macauley	Bloemfontein
1931—33	* L. L. Horrell	Pretoria
1933—34	* L. F. Bickell	Port Elizabeth
1935—36	* G. G. Ewer	Pietermaritzburg
1936—37	* A. Rodwell	Johannesburg
1937—38	* J. H. Gyles	Durban
1938—39	H. A. Eastman	Cape Town
1939—44	* I. J. Nicholas	Umtata
1944—45	* A. Rodwell	Johannesburg
1945—46	J. S. Clinton	Salisbury
	* J. W. Phillips	Bulawayo
1946—47	G. J. Muller	Bloemfontein
1947—48	C. Kinsman	Durban
1948—49	* A. Foden	East London
1949—50	D. A. Bradley	Port Elizabeth
1950—51	C. R. Hallé	Pietermaritzburg
1958—59	C. G. Downie	Cape Town
1952—53	A. R. Sibson	Bulawayo
1953—54	* J. C. Fraser	Johannesburg
1954—55	G. J. Muller	Bloemfontein
1955—56	* D. J. Hugo	Pretoria
1956—57	J. E. Mitchell	Salisbury
1957—58	J. L. van der Walt	Krugersdorp
1958—59	C. G. Downie	Cape Town
1959—60	* R. W. Kane	Johannesburg
1960—61	R. M. O. Simpson	Durban
1961—62	C. Lombard	Germiston
1962—63	P. A. Giles	East London
1963—64	J. C. Downey	Springs
1964—65	R. W. Barton	Welkom
1965—67	* D. Murray-Nobbs	Port Elizabeth
1967—69	G. C. Theron	Vanderbijlpark
1969—71	H. T. Turner	Umtali
1971—73	J. K. von Ahlften	Springs
1973—75	J. C. Waddy	Pietermaritzburg
1975—77	E. de C. Pretorius	Potchefstroom
1977—79	K. G. Robson	East London

* Deceased/Oorlede

AANWYSING VAN ADVERTEERDERS
INDEX TO ADVERTISERS

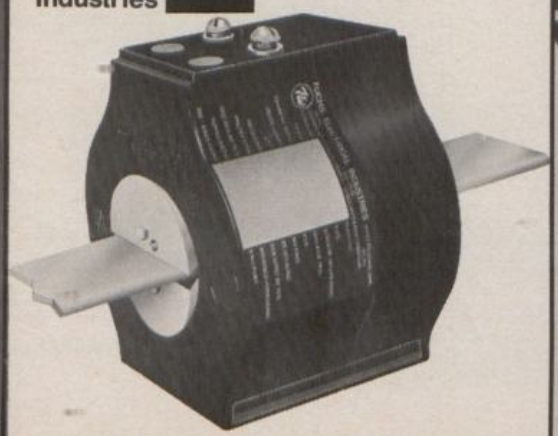
GEDRUK DEUR TRANSO PERS

Fuchs Instrument Transformers. Designed to a spec. Guaranteed to that spec.

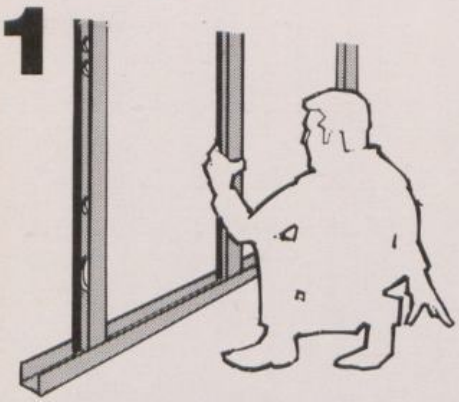
When you need an instrument transformer, Fuchs make sure you get exactly the one you need. If it isn't in our standard range we'll design one to your specifications and we back those specifications with a test certificate. Because we have the necessary equipment to test each one to ensure compliance with BSS 3938-1973 and IEC 185. That's an important feature in metering and protection, where accuracy is paramount. We put the same thought into design as as we do into technical back-up support. Perhaps that's another reason why Fuchs is synonymous with instrument transformers.

Fuchs Electrical Industries

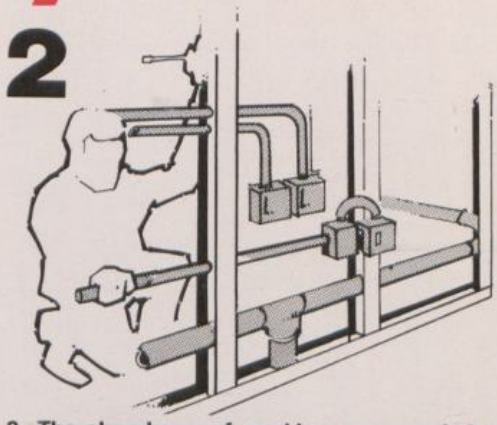
Leaders in the electrical field.



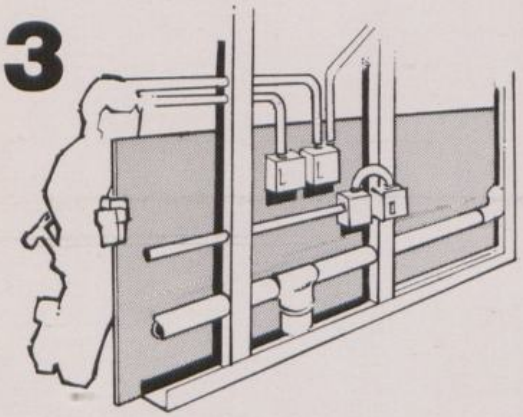
Its light work wiring the Rhino Drywall systems!



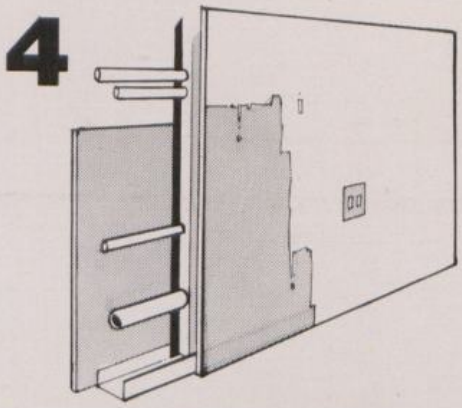
1. Once the carpenter (or drywall erector) has erected the framework...



2. The abundance of working space and the elimination of chasing make the plumber and electrician's task a joy. Its convenient and time saving, so...



3. With the pipes and conduiting in place, the drywall erection team apply the Rhinoboard cladding to the framework,

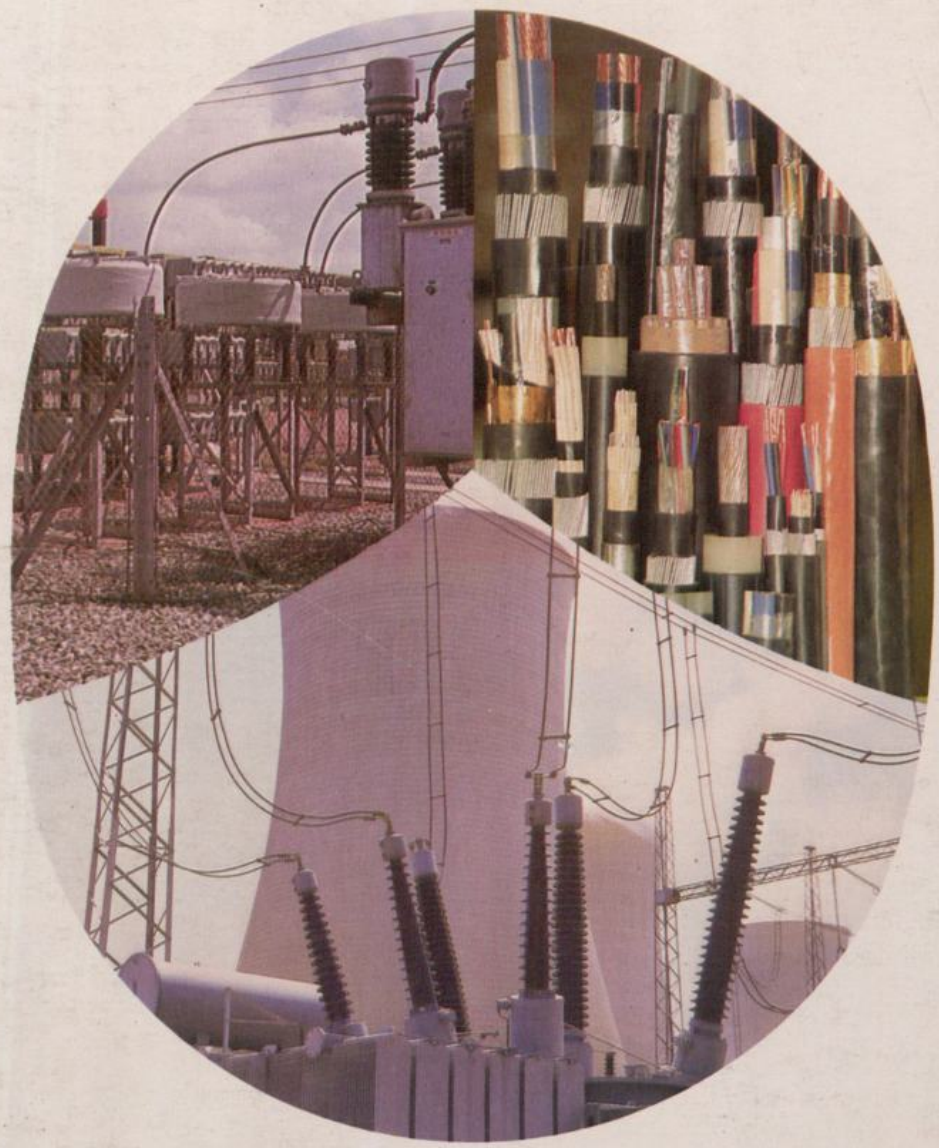


4. Leaving the electrician and plumber to provide the finishing touchers in the form of plugs and cover plates before the painter decorates the finished wall.

The resulting fully serviced and attractive wall is completed in a fraction of the construction time of a conventional wall!

Rhino Building Products

Head Office, Bedfordview 615-6470. Cape, Paarden Eiland 51-6021. OFS, Bloemfontein 22-4826. Natal, Pinetown 72-9236. Port Elizabeth 32-2948.



ASEA

POWER IN THE SERVICE OF MANKIND

The range of products manufactured by Asea in South Africa include the following:

Power and distribution transformers from 25kVA to 800 MVA (up to 400kV)
Instrument transformers (up to 275 kV)
Surge arrestors (up to 132 kV)
Disconnectors (up to 400 kV)
PVC cables
PEX cables (up to 33kV) including accessories
Telephone, pilot and control cables
Aerial self supporting cables
LIFLAM flame retardant cables

Although we are a public South African company, established in 1946, we still have access to the technology and expertise of the vast international ASEA Group.

This valuable international link has enabled us to serve South Africa in the forefront of engineering, with many "firsts" to our credit.

Asea Electric South Africa Limited.

P.O. Box 691
Pretoria 0001

Tel: (012) 79-7020
Telex 3-725 SA

C.v.J&A 0090