

# 50 KONVENSIE CONVENTION



DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS  
VAN SUID-AFRIKA

THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF  
SOUTH AFRICA

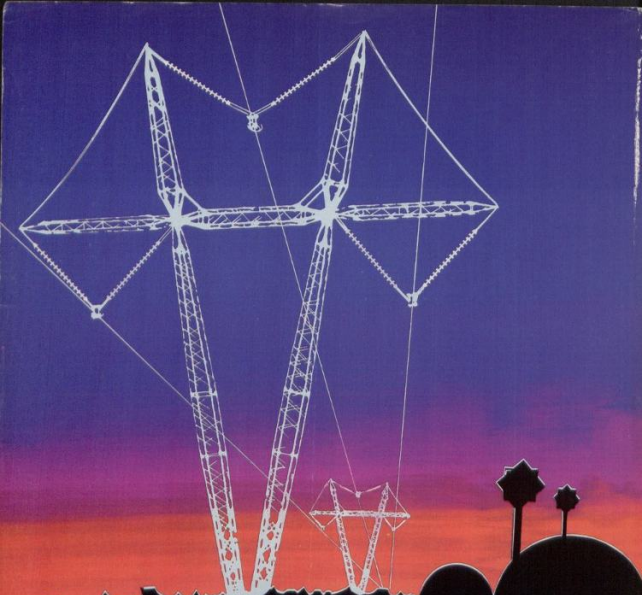
28 — 30 SEPT. 1987



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Cullinan Electrical is committed single-mindedly to the supply of equipment, experience and expertise to the transmission, control and measurement of electrical energy.

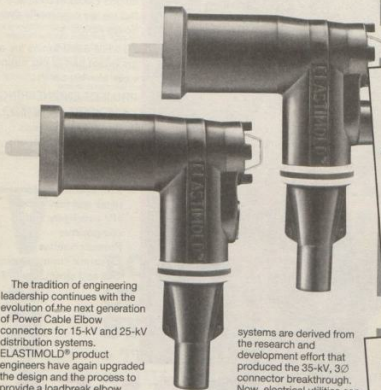


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The new PCE Power Cable Elbows for 15-kV and 25-kV

systems are derived from the research and development effort that produced the 35-kV, 3Ø connector breakthrough. Now, electrical utilities can upgrade their distribution systems by specifying the advanced PCE connectors.

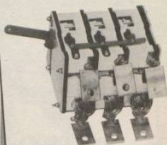
# ELASTIMOLD®

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Over 40 years of high performance



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For complete transformer system protection



Westinghouse transformer components division

**Voltage Detectors**  
Extremely robust & reliable  
indoor and outdoor



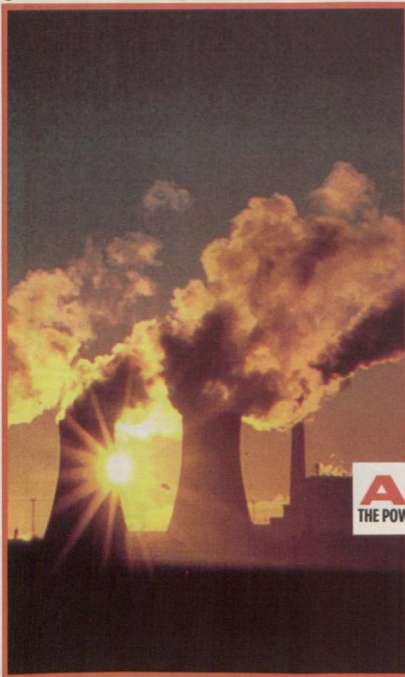
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Power Systems

Johannesburg: 616-1960, Cape Town: 24-4364/5 or Durban 37-5594/5  
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# If you think Asea builds big transformers you're 25% right



Our activities include manufacturing a wide spectrum of industrial electrical equipment — electrical supply authorities being our key speciality.

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So while transformers are an important part of our business we're also big on:

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- Power factor correction
- Turnkey HV projects
- Specialised substations
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#### PRODUCTS

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- HV switchgear and components
- Protection relays
- Electronic control systems
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From design through to construction and commissioning we offer the following systems on a turnkey basis:-

- Outdoor Switchyards and Indoor Substations
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# ELECTRICAL CABLES

## ABERDARE GROUP

The Aberdare Group has developed into one of South Africa's strategic industries and today it is the major producer of power cable, wire and communication cable: contributing significantly to the country's power and communication requirements.

There are a number of specialist companies within the Aberdare Group, viz. Aberdare Cables Africa, producing at Port Elizabeth, ASEA-Scottish, producing at Roslyn and Pietermaritzburg, and Contronics who manufacture specialised cable and are suppliers of a wide range of process control equipment.

With more than 30 years of experience in the design, development and manufacture of electric cable, the Aberdare Group can offer several hundred different types within the range listed below. These are manufactured to recognised SABS and international specifications. We can also design cable to suit customers' specific requirements.

### Product range:

- Paper insulated cable — up to 42 kV
- XLPE-insulated cable — up to 42 kV
- PVC insulated cable — up to 6,6 kV
- Lo-Tox cable — up to 6,6 kV
- Signalling, auto and airport lighting cable
- Housewire, domestic flexible cords
- Twin and earth wiring systems/Surfix
- Coaxial cable
- Instrumentation cable
- Communication cable and Telephone Cable
- Optical fibre
- Aluminium overhead stranded conductor (including aluminium alloy)
- Aerial Bundled Conductor (ABC)
- Bare copper conductor
- Trailing cable — rubber and XLPE
- Cable accessories can be supplied for different insulations and voltages

### Mobile Service Unit

The Group has a fully equipped mobile unit for jointing, testing and commissioning services, specialising in emergency repairs on cable systems.

### Research and Development

Access to international technology and expertise enables us to provide complete up-to-date technical advice and after-sales-service. Our commitment to quality is in line with the SABS Quality Assurance requirements.



Duracast joints offer simplicity, reliability and safety in low-voltage applications. Kits include a two-part polyurethane resin.



Vulkit and Vulbert jointing and terminating kits for XLPE-insulated cables — designed to maintain continuous operating temperature of 90 °C and emergency overload temperature of 130 °C.



Straight-through joints for Paper-insulated cables. The design has been rigorously tested under over-voltage and over-current conditions. All components are locally manufactured.

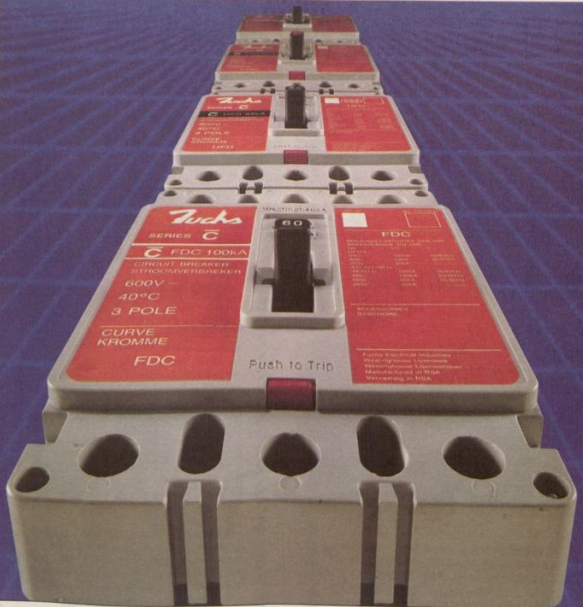
## Aberdare Cables Africa Limited

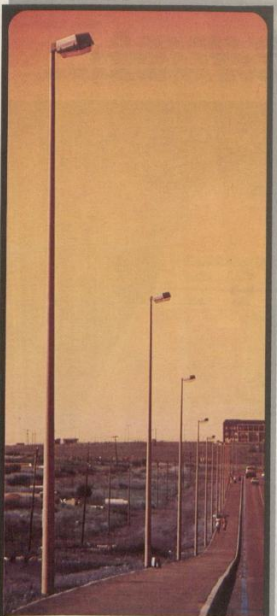
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High efficient street lighting range designed to meet lighting requirements as laid down by SABS 098.

Highly efficient computer designed reflector systems achieve outstanding spacing to mounting height ratio.

Fibreglass lighting pole for ease of installation, maintenance-free and attractive appearance.

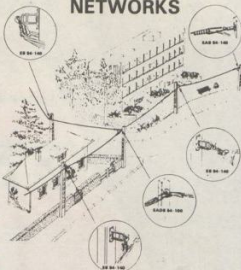
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- Only two pieces of hardware needed to erect bundle
- Phase and neutral midspan joints preinsulated allowing connector to be crimped through insulation eliminating need to insulate joint after crimping
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- Bundled conductor consists of 3-phase cores, 1 lighting core, 1 neutral/catenary core
- The most economical overhead insulated cable system

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## Let Tubewrights design your security lighting pole



Tubewrights (A Division of Dorbyl Structural Engineering) can assist you in designing a safe, economic, and "To Suit Your Requirements" security lighting pole.

By using advanced computer design we can supply you with a detailed computer print-out with all relevant information, **AT NO COST.**

The poles can be manufactured from tubular, round tapered or octagonal sections.

With Tubewrights quality control and products hot-dip galvanised to SABS 763 specification, we ensure that you receive a pole of high standard which is synonymous with Tubewrights.

## Laat die ontwerp van u veiligheid-beligtingpale aan Tubewrights oor



Tubewrights ('n Afdeling van Dorbyl Structural Engineering) sal u bystaan met die ontwerp van u veiligheidbeligtingpaal wat nie net by u omstandighede aanpas nie, maar wat ook veilig en ekonomies is. Met behulp van ons gevorderde rekenaarontwerp kan ons die nodige inligting gratis aan u verskaf.

Ons vervaardig buisvormige, rondtaps en agtkantige pale.

Met Tubewrights se gehaltebeheer en produkte wat warm dompel-gegalvaniseer is volgens SABS 763 spesifikasie, verseker ons 'n produk van hoogstaande gehalte wat eie is aan Tubewrights.

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# ATC

## A TOTAL CAPABILITY IN FIBRE OPTICS

### Making the fibre . . .

ATC combines hi-tech South African innovation with the best that overseas technology can offer. This has led ATC to become the only manufacturer of optical fibre in South Africa.

1. A chemical deposition process, producing optical fibre preforms.
2. Preform inspection.
3. The drop at the start of optical fibre drawing.



### cabling the fibre . . .

ATC opened South Africa's first optical cabling plant in 1982 and produces a wide range of cables such as:

- Underground and aerial, metallic and non-metallic.
- Single- or multi-fibre.
- Single-mode or multi-mode.
- Composite fibre and copper cables.
- Armoured or unarmoured.

1. Stranding the fibres.
2. Buffering the fibres.
3. Quality control of optical fibres.



### and putting the fibre to work . . .

The creative drive and bold innovation that led ATC to bring optical fibre to South Africa is now being applied to optical fibre system applications.

Our range of products and services include:

- Computer links and LAN'S.
- Video links for CCTV.
- 2 and 8 megabit PCM line terminating equipment.
- Links for process control and protection.
- Connectors, tails, fly-leads and accessories.
- Installation, and maintenance.

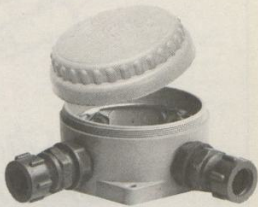
1. Fibre optics connectors and tails.
2. Installing fibre optics.
3. Fibre optic terminal equipment.



# SPEC. + CCG = POM\*



Specification of the correct product at the time of an electrical installation is all important. Wrong spec can equal disaster. So, make sure you choose the right product for the job from the range of CCG junction boxes and cable glands.



**\*Specification + CCG products = Peace of Mind**

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electrical contractor?***



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His work is guaranteed!\****

*\*The Electrical Contractors' Association (South Africa)'s "Guarantee of work" scheme protects employers, who are not covered by standard conditions of contract, against shoddy or defective workmanship to a value of R10 000,00.*



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Telex: 4-84073 SA



# THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTH AFRICA

613 VOLKSKAS BUILDING, 76 MARKET STREET, JOHANNESBURG 2001. TEL. (011) 838-7711

## DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS VAN SUID-AFRIKA

VOLKSKASGEBOU 613, MARKSTRAAT 76, JOHANNESBURG 2001. TEL. (011) 838-7711

OFFICIAL PROCEEDINGS  
50TH CONVENTION  
28TH SEPTEMBER TO  
30TH SEPTEMBER 1987



AMPTELIKE VERRIGTINGE  
50e KONVENSIË  
28 SEPTEMBER TOT  
30 SEPTEMBER 1987

SECRETARY - SEKRETARIS

ADVERTISING ENQUIRIES - ADVERTENSIE NAVRAE:

Bennie van der Walt  
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The AMEU is the body to bring together municipal councillors, electrical engineers and all persons interested in the advancement and the development of undertakings and to promote wider contact and the exchange of views.

Opinions expressed in papers or discussions do not necessarily represent the official views of the AMEU.

Die VME0 is die organisasie om munisipale raadslede, elektrotegniese ingenieurs en alle persone met belang in die bevordering en ontwikkeling van ondernemings bymekaar te bring en om wyer kennismaking en die wisseling van sieningswyses te bevorder.

Menings uitgespreek in referate of besprekings verteenwoordig nie noodwendig die amptelike menings van die VME0 nie.

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7. ESKOM - (Lood Rothman) .....

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8. Committee: Statutory regulations / Komitee: Statutêre regulasies (J K van Ahlften) .....
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26. Advertisers - Adverteerders .....



*Alwin Fortmann, President of the A.M.E.U.*





*Arms: Or, on a fess enhanced indented Azure between in chief five annulets Or and in base a cog-wheel Azure within three fleurons of lightning disposed in triangle point downwards Or, a barbetel Argent. Crest: Torse surmounting a mural crown Or, a torch Or enflamed proper. Mantling: Or and Azure. Motto: FIAT LUX.*

*It is hereby certified that in terms of the Heraldry Act a coat of arms as illustrated and blazoned above has been registered for*

**THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTH AFRICA.**

TABLE OF ATTENDANCE / TABEL VAN BYWONING

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Engineers	145	Ingenieurs
Associates	13	Assosiaatlede
Affiliates	170	Geaffilieerdes
Ladies	266	Dames
Staff	<u>11</u>	Personeel
	<u>730</u>	
Apologies	12	Verstekings

OFFICIAL OPENING/AMPTELIKE OPENING

Rev. David Lloyd-Jones opened the proceedings with scripture reading and prayer.

**MNR. J.A. LOUBSER: UITTREDEDE PRESIDENT**

Sy Agbare die Burgemeester van Kaapstad, raadshere Peter Müller, die Burgemeester van Boksburg, raadslid J.P. Buckle, mnr. Pietie du Plessis, Minister van Mannekrag en Openbare Werke, dit is vir my 'n besondere voorreg om u welkom te heet by die 50ste Konvensie van die Vereniging van Munisipale Elektriesiteitsondernemings van Suid-Afrika wat alreeds 72 jaar oud is. Verder is dit ook paslik dat hierdie 50ste Konvensie in die Moederstad moet plaasvind.

Dit is egter met leedwese dat ek moet aankondig dat die volgende persone sedert ons vorige Konvensie heengegaan het: Mnr. Pine Pienaar: Voorheen Elektrotegniese Stadsingenieur van Glencoe.

Mr. Bill Rush: Past Member.

Mnr. Alfred Augustus (Gus) Weich: Voormalige Hoof Direkteur van Beroepsveiligheid en Ereleid van hierdie Vereniging.

Mr. G.R. (Dick) Beard from Grahamstown.

Mnr. Jannie van der Walt: Voormalige lid.

Mnr. J.M. (Koos) Gerike: Voorheen Elektrotegniese Stadsingenieur van Klerksdorp.

Jan Smit: Voorheen algemene bestuurder van E.V.K.O.M.

Mnr. A.P. Lotriet van Alusaf, Richardsbaai wat gerigistree het en sedertdien oorlede.

Lionel Doman of Nigel was on his way to the Convention when he received a message that his wife passed away.

I request all present to stand in silence as a mark of respect.

'n Spesiale woord van welkom aan mnr. Pietie du Plessis wat later die Openingsrede sal lewer. U is by ons so bekend dat ek nie kan glo enige verdere bekenstelling is nodig nie. Ons probeer nou al 'n paar jaar om 'n Minister te kry om ons Konvensie te open, maar dit is die eerste keer dat ons daarin kon slaag. Gelukkig 'n Minister met 'n baie paslike portefeulje!!!

A special welcome also to a number of guests from Organisations both in South Africa and from Overseas. From Escom, Mr. Rothman who attends also on behalf of Mr. John Maree and Messrs. Harmse, Opperman, Van Deventer and Waldron. From S.A.B.S. Dr. Johnston and Messrs. Kruger, Toms, Van Alphen and Jansen.

Van die Departement Openbare Werke, mnr. Prins en Van den Bergh. Van die Departement van Beroepsveiligheid mnr. du Plessis, Horn en Pym.

From the Transkei Electricity Supply Corporation Messrs. Collins and Stone.

Verder verwelkom ek hiermee ook die verteenwoordigers van Munisipale Verenigings en Institute nl. Prof. De Clerq van die V.M.B. mnr. Du Toit van die Instituut van Openbare Gesondheid, Dr. Stanley Evans, President van die Instituut van Stadskerke en mnr. A.P. Burger, vorige Stadsklerk van Johannesburg van wie u nog later meer sal hoor. Ek is egter teleurges-

teld dat hier nie meer Institute teenwoordig is nie, maar dit is blykbaar as gevolg van die Munisipale Vereniging van Transvaal wat hulle jaarlikse Kongres nou geskuif het sodat dit met dié van die V.M.E.O. bots.

We are also proud to have with us today Honorary Members and Past Presidents and I ask them to stand up so that we may extend a special welcome to them.

Dr. Ralph Anderson

Wessel Barnard

Bill Beesley

Horace Eastman - 96 years of age (President in 1938)

Hennie Hugo

Terence Marsh

Pat Middelcote

Eugene Pretorius

Ken Robson

Les Smith

Gawie Theron

Jules van Ahlften

Dr. Naude van Wyk

Raadslid Robbie de Lange

Piet Botes

Denis Fraser

En nu bly daar nog die grootste en belangrikste groep oor om te verwelkom. Dit is u die Afgevaardigdes. Dit is goed om belangrike persone by so 'n Kongres te hê, maar sonder u die Afgevaardigdes sou daar nooit 'n Kongres gewees het nie. Wees daarvan verseker dat u teenwoordigheid opreg waardeur word en neem die vrymoedigheid om aan alle besprekings en sosiale geleenthede ten volle deel te neem. Welkom aan u almal!!!

And now Ladies and Gentlemen, it is my privilege to call on Alderman Peter Muller, Mayor of Cape Town, to address you.



'n Blik op die 730 afgevaardigdes in die Cape Sun Hotel.

## WELCOME TO CAPE TOWN BY HIS WORSHIP THE MAYOR OF CAPE TOWN ALDERMAN PETER MÜLLER

Mnr die President, mnr die Minister, die Agbare Burgermeester van Boksburg, geeëerde gaste, dames en here.

Dit is my besondere voorreg vanoggend om namens die Moederstad se Stadsraad en die inwoners van Kaapstad en Wes Kaapland, u vanoggend hier welkom te heet.

It is always a great privilege to say "Welcome to Cape Town", because in the final analyses, the reason for Cape Town's existence is in fact, that it was put here, or founded, to provide hospitality and refreshments for the somewhat "unwilling tourists" of old. But particularly in these days, when in fact we at the bottom end of Africa are somewhat isolated from the rest of the world, and even sometimes from the rest of South Africa, it would seem.

We believe that it is a great privilege to have people in this, what we believe is one of the most beautiful parts not only of this Country, but of the world. I hope that those of you who are here for the first time, will in fact use the next three days and hopefully a few days after that, if you have the time available, to dis-

cover the beauties of the Western Cape. We are very very proud of this part of the world.

Ek is seker die van u wat al talle kere hier was, sien altyd uit om weer terug Kaap toe te kom. Per slot van rekening, ons het almal 'n sagte plek vir die Moederstad.

Mr President, I am given to understand that it is some 16 years ago that we last had the privilege of hosting a Convention of this nature, and on that occasion I believe, we co-hosted it with Springs whose Electrical Engineer at that time was the incoming President of the AMEU.

Today on the 50th Convention we have the privilege of co-hosting it, with Boksburg whose delegate will be your incoming President, and it gives me great pleasure, together with the Municipality of Boksburg, to say "Welcome to this the Fairest Cape in all the World". I hope you enjoy your Conference.

I thank you.

## INDUCTION OF PRESIDENT / INHULDIGING VAN PRESIDENT

Mnr J A Loubser

Mnr, die Burgemeester, mnr, du Plessis, dames en here - gedurende die afgelope twee jaar het ek die voorreg gehad om die amp van President te beklee. Ek kan nou vir u sê dat dit uiters aangenaam was en dat dit vir my moontlik was om wyer kontak te maak met organisasies en persone waarvan ek in die verlede net gedroom het. Ook was dit vir my moontlik om tenminste een keer by elk van die verskillende takke besoek af te lê tydens 'n takvergadering en daar was dit vir my moontlik gemaak om die lede en geaffilieerdes van hierdie vereniging nêr intiem te leer ken en ek kan nou vir u sê dat u vër sal moet soek om 'n beter groep bymekaar te kry. Dit is as gevolg van hulle samewerking dat ek kan sê dit was heerlik om President te wees.

Vir my is daar geen twyfel nie dat die V.M.E.O. die uitdaging van tyd waarin ons leef sal kan aanvaar nie en nou dink ek spesifiek aan Streeksdiensterade ens.

I was also privileged to attend meetings and conferences of the Municipal Association of Transvaal, the Institute of Town Clerks, the Institute of Treasurers and Accountants, the Institute of Traffic Officers, the Institute of Organisation and Methods, the Institute of Municipal Engineers and the International Electrotechnical Commission in Berlin, West Germany.

U sal onthou dat toe ek President geword het ek belowe het om die beeld van die V.M.E.O. so vër as moontlik uit te bou. Ongelukkig moet ek rapporteer dat ek slegs beperkte sukses gehad het. Die jongste aanduidings is egter baie meer positief.

Nou het ek by die end van my tydperk gekom, maar ek sal fouteer as ek nie 'n paar bedankings doen nie.

To the members of the Standing Committee and specifically to the President Elect, Alwin Fortmann and the Secretary, Bennie van der Walt and to the Councillor and Engineer members of the Executive Council, I would like to thank you for your co-operation and support to get through the rather full agendas. It has been a privilege to work with you.

To all the Affiliates and specifically to the Affiliates Committee my thanks to you for your valued support.

To my own Town Council and specifically to Councillor Danie Taljaard and his wife Anna, my colleagues and other employees of Benoni Town Council my sincere thanks for having made it possible for me to hold this high office.

Aan my egenote, Martie, wil ek besonders dankie sê vir wat sy gedoen het. Ek weet die senuwees het maar somtyds geknaag

maar ek glo ook dat niemand dit beter sou gedoen het nie.

En heel laaste aan die Vader vir die krag, moed en verstand wat hy my gegee het om die twee jaar suksesvol af te handel.

En nou mnr, die Burgemeester het ek nog een groot voorreg en dit is om die tuig te oorhandig aan 'n man van die kaliber van Alwin Fortmann. Ek dink u die kongresgangers het al agtergekem dat alles wat Alwin doen altyd perfek is soos weer bewys sal word met die reëlings van hierdie Konvensie. Ek het Alwin die afgelope twee jaar beter leer ken as meeste van u en ek kan u verseker groot dinge lê vir ons voor in die tye wat kom.

Mnr. Fortmann, dit is nou my eer en voorreg om namens die V.M.E.O. u te versoek om na vore te kom om die Presidentskettling in ontvangs te neem as President van die V.M.E.O. vir die volgende twee jaar.



Die inhuldiging van Alwin Fortmann as President van die V.M.E.O. deur Jan Loubser, die uitdurende President.

### Mr. A H L FORTMANN: PRESIDENT

My innige dank aan u, mnr Loubser.

Mr Minister, Mr Mayor of Cape Town, Alderman Muller, Mr Mayor of Boksburg, Councillor Buckle, distinguished guests, ladies and gentlemen.

To this Association, which has honoured me with the Office of President, I am indeed deeply grateful. The immensity of the moment becomes a little more apparent when I ponder the relatively small number of AMEU members who are granted the

privilege of becoming president of this august body. My town, Boksburg, which I represent, although unable to host the Convention, and which this year celebrates its Centenary, also shares this honour. I would also like to thank my Council for the wholehearted support I have received. This is the first time in Boksburg's history that its Town Electrical Engineer is elected to the Office of President of the AMEU.

Besides Boksburg's Centenary, the AMEU has reached an important milestone in its history in holding its 50th Convention.

However, to you Mr Mayor, the AMEU is deeply indebted for the invitation to hold its Convention in this your beautiful City of Cape Town.

My wife, Joy, is of course not the least unhappy about the venue as this is her city of birth.

My Town Clerk, Mr Leon Ferreira, who in the meantime has been appointed Chairman of the East Rand Regional Services Council, would have been with us at this Convention, had the Transvaal Municipal Association, on which he serves as an executive committee member, not changed its conference dates, what, I would like to add, President of the Institute of Town Clerks from June 1985 to June of this year.

Furthermore, Mr Pieter Vermaak, Boksburg's Deputy Chief Licence and Traffic Officer held the office of President of the

South African Institute of Licence Officers, from 1 November 1985 to 31 October 1986.

I wonder which other city or town in South Africa holds the distinction of having had three of its officers elected to the office of President of their respective institutes at about the same time.

If this is not unique, then certainly it is a distinction Boksburg can be proud of.

Vir my lê daar 'n reuse taak voor, maar ek weet ook dat ek op u, my kollegas en die Uitvoerende Raad kan staat maak om my by te staan.

Ek besef terdeë dat ek in die voetspore van voorgangers, wat uitstekende leiding aan hierdie Vereniging verleen het, volg. Dit is dus my bede dat ek u op so 'n wyse sal dien, wat u nie sal teleurstel nie en wat die VMEO se naam hoog sal hou en ook dit wat die VMEO oor die afgelope twee-en-sewentig jaar vermag het, verder saam met u uit te bou.

I would also like to thank my wife Joy, for all the assistance she has given me over the years and in particular during the recent period leading up to this Convention. It is this assistance, which has helped to clam jittery nerves, which sometimes want to get the better of one.

Again, I say thank you.

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## PRESENTATION TO IMMEDIATE PAST PRESIDENT

Mr Loubser, may I ask you to please rise.

Dit is nou my aangename plig om Mnr J A Loubser, uitgetrede President, hartlik vir sy uitstekende wyse waarop hy hierdie Vereniging oor die afgelope twee jaar geleidelik, te bedank. Hy het die vermoë gehad om die sake wat hy moes afhandel, op 'n baie kalmte wyse te kon doen.

Uit erkentlikheid vir sy diens aan die VMEO, is dit nou vir my 'n voorreg om hierdie welverdiende huldeskrif en wapen aan hom te oorhandig.

Jan, ek hoop dat hierdie huldeskrif jou altyd aan jou amptstermyn as President, sowel as die baie jare wat jy saam met jou kollegas en vriende in hierdie Vereniging was, vreugde sal verskaaf en as herinnering sal dien.

Ek vra jou nou om hierdie huldeskrif in ontvangste te neem.

Hierdie sertifikaat word met dankbare erkentlikheid aan Johannes Abraham Loubser aangebied vir die waardige en inspirerende wyse waarop hy voldoen het aan die eise van die hoë amp van President van die Vereniging van Munisipale Elektriesiteitsondernemings van Suid Afrika vir die periode 1985 tot 1987.



Jan Loubser ontvang 'n huldeskrif van Alwin Fortmann

Ook word met waardering, erkenning betuig vir sy onbaatsugtige pogings om die doelstellings van die Vereniging te bevorder. Dit is aangebied deur die Vereniging van Munisipale Elektriesiteitsondernemings van Suid Afrika op hierdie 9ste September 1987 te Kaapstad.

Mnr Loubser, baie geluk.

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## PROPOSAL OF PRESIDENT ELECT

### M P P CLARKE: RANDBURG

Mr President, honoured guests, Ladies and Gentlemen, during the early 1970's it was my privilege to serve the town of Newcastle and to be involved in the work of the AMEU's Natal Branch.

About this time a young engineer made a brief entry into our activities. He had been appointed Town Electrical Engineer of Vryheid in 1970 and held the position for some two or three years.

Having arrived in "last outpost" territory from this very lovely Western part of the Republic - Paarl, no less, where he trained under Mr H C Dreyer a member of Association for many years - he experienced the not uncommon reserve which is found in the

land of the "stiff upper lip", where getting to know people can sometimes take a little time!

However, this young man took things in his stride. He made meaningful contributions to our AMEU activities and to the electrical industry as a whole. It was obvious to us from his dynamic and clear thinking approach to problems, and his willingness to calmly and fearlessly formulate and express his opinion, that he would make his mark.

En dit het toe gebeur . . . ! In sy dertigste jaar is hy as Elektrotegniese Stadsingenieur te Bloemfontein aangestel.

Hy is in 1980 as lid van die VMEO Uitvoerende Raad verkies en lewer tot dusver uitstekende diens aan die Organisasie. Onder

andere het hy ook baanbrekerswerk gedoen oor opleiding en opleidingsentrums en het daarin geslaag om amptelike goedkeuring vir standarde wat nou as VMEQ riglyne aanvaar is, te kry. Hy het ook 'n leidende rol gespeel met die stigting van ons Vrystaat Tak.

Intussen het hy aan die Universiteit van die Oranje Vrystaat studeer en voordat jy jou oë kon uitvee, behaal hy 'n Meesters Graad en daarna 'n Doktors Graad. Sy proefskrif handel oor "Beplanning van die voorsiening van Elektriesiteitsdienste deur Munisipale Owerhede".

Ek is seker teen hierdie tyd is u almal bewus van wie ek praat. Mnr die President, Nicolaas Stephanus Botha is 'n man van aksie, in sy werk sowel as in sy privaat lewe. Onder andere ruim hy tyd in vir tennis, golf, krieket, ensovoorts en lewer ook 'n bydrae in die gemeenskap.

Maar hy is ook 'n gesinsman, en hy is trots op sy vrou, Marietjie en hulle drie kinders.

Nico is no longer the "young" man that I first met in 1970 - and in fact he doesn't call me "oom" anymore! - but he is very active and dynamic and I believe he will be able to lead the AMEU in the future with distinction.

Dit is vir my 'n plesier en 'n voorreg om Dr Nico Botha as aangewese President van die VMEQ aan u voor te stel.

#### PROFESSOR RYNO KRIEL: BLOEMFONTEIN

Mnr die President, mnr die Minister, Sy Edelagbare die Burgermeester van Kaapstad en van Boksburg, eregaste, dames en here.

Dit is voorwaar 'n besondere voorreg om die nominasie van dr Nico Botha as Aangewese President te sekkondeer.

Die Stadsraad van Bloemfontein het hom leer ken as 'n persoon bedeel met besondere gawes, waarvan nie net sy akademiese prestasies getuig nie, maar ook die bekwaame wyse waarop hy as Hoof van sy Departement sy taak verrig.

As ons na sy loopbaan tot dusver kyk, word 'n mens getref hoe vinnig hy van 'n Vakleerling in 1959 tot die pos van Elektrotrogniese Ingenieur van die Bloemfontein se Stadsraad in 1973 gevorder het. En asof dit nie genoeg was nie, mnr die President, het hy hom ook verder in die Akademie bewaam en in September 1985 'n Doktorsgraad aan die Universiteit van die OVS behaal, waarna die voorsteller mnr Clarke alreeds verwys het.

Ten spyte van al hierdie prestasies het hy nog beskeie gebly en ook gedurig die belang van sy medemens of die hart gedra. Met ander woorde mnr die President, hy is 'n man uit een stuk met albei sy voete plat of die aarde.

## VERWELKOMING NA DIE KONVENSIË DEUR SY AGBARE DIE BURGEMEESTER VAN BOKSBURG, RAADSLID J P BUCKLE

Mnr die President, minister P T C du Plessis en u Agbare raadshere Müller Burgemeesterspaar van Kaapstad, eregaste, dames en here. Dit verskaf my groot genoë om u na hierdie 50ste Konvensie van die Vereniging van Munisipale Elektriesiteitsondernemings van Suid-Afrika, te verwelkom.

Dit is vir my duidelik dat hierdie Konvensie, geoordeel aan die insiggewende referate wat hier voorgedra staan te word, die groot getal afgevaardigdes asook die feit dat die Konvensie in die pragtige stad Kaapstad plaasvind, uiters geslaagd sal wees.

Ek hoop en vertrou dat die Konvensie sal bydra om u Vereniging se aansien nog meer in die kollig te plaas. U lude is vir 'n baie belangrike diens, naamlik die voorsiening van elektrisiteit, verantwoordelik. Sonder hierdie diens kan en sal ons land nie voortuitgaan nie. Wanneer 'n kragonderbreking plaasvind, word eers werklik besef tot hoe 'n mate die mens vandag van elektriese krag afhanklik is.

Mr President, on behalf of the Convention I wish to thank you

Mr President this is the man whose nomination for President I elect I second today. On behalf of my Council, I wish to thank the AMEU for the honour bestowed on Nico Botha. I am confident that with his talents he will, in all respects, be a worthy President Elect.

I thank you.

#### DR NICO BOTHA: BLOEMFONTEIN

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

Mr President, allow me first to congratulate you on your election to the high office of President of this Association. Furthermore I wish you and your good lady a happy and successful two years of office. I assure you that it will be my privilege, to which I am looking forward, to work with you during the next two years. However, in the light of the arrangements made and what is in store for us, I do not think you need any assistance.

May I Mr President, at this early stage, congratulate you on the arrangements, and I have no doubt that this will be a memorable Convention.

Mnr die President, dames en here, dit is vir my 'n besondere groot eer om aangewys te word as Aangewese President van hier die Vereniging. Dit geld nie alleen vir my nie, maar ook vir my vrou, my familie en ook vir die Stad Bloemfontein. Ons is diep bewus van die hoë eise wat van hierdie pos verwag word. Nietemin vertrou ons dat ons met al ons tekortkominge, die diens aan die Vereniging en die gemeenskap kan lewer, wat van ons verwag word.

Graag wil ek ook van hierdie geleentheid gebruik maak om aan "Oom" Max Clarke, dankie te sê vir sy mooi woorde. Baie dankie Max. So ook aan Raadslid Kriel wat die voorstel geskondeer het, baie dankie Professor en baie dankie ook vir al die jare wat u saam met my hierdie pad bewandel.

Ek dink mnr Dreyer, die persoon onder wie se lyding ek my munisipale loopbaan kon begin, is ook vandag hier teenwoordig. Ook aan mnr Hennie Dreyer vir sy bydrae oor die jare, baie dankie.

Mnr die President, aan u en u Uitvoerende Raad en lede van hierdie Vereniging wat vir my verkies het, baie dankie vir u ondersteuning en die vertroue wat u in my gestel het. Ek onderneem vandag hier teenoor u dat ek alles in my vermoë sal doen om die doelstellings van hierdie Vereniging na te streef en uit te dra.

Baie dankie.

and his Worship the Mayor of Cape Town for inviting this Association to hold its Convention in Cape Town and for all the arrangements, for what I believe, will be a memorable Convention.

The City of Cape Town - the Mother City of South Africa, is a beautiful city and an ideal centre to host a convention such as this.

Mr President, thank you for arranging for the placing of Boksburg's Coat of Arms in this convention centre. This is indeed appreciated.

Mnr die President, vergun my 'n oomblik om iets van Boksburg te sê.

Toe mnr B Owen-Jones in 1903 verkies is as Burgemeester van Boksburg, was hy die eerste, en vir enkele ure ook die engste Burgemeester in die Transvaal.

Boksburg se geskiedenis gaan egter verder terug as 1903. In



1875 is goud op die plaas Vogelfontein ontdek, en word 'n groot aantal prospektoreers na die omgewing gelok. President Paul Kruger magtig die stigting van 'n dorp op die plaas en in 1887 word 'n duisend erwe opgemeet en word Boksburg amptelik gestig – vernemoen na die Staatssekretaris van die Transvaalse Republiek, mnr W E Bok.

Sedert 1887 het Boksburg gegroei om vandag 'n munisipale gebied van 196,07 vk km of ongeveer 19600 hektaar te beslaan.

Boksburg is ongeveer 18 km ten ooste van Johannesburg in die nywerheids- en ekonomiese hart van Suid-Afrika geleë en direk langs die Jan Smuts Internasionale Lughawe. Van die grootste, diepste en rykste goudriewe in die wêreld lê in sy skoot.

Tot voor die Tweede Wêreldoorlog was Boksburg se enigste noemenswaardige nywerheid sy goudmyn, en die East Rand Proprietary Mines Bpk (ERPM), wat vandag nog een van die wêreld se grootste en diepste myne besit, ( $\pm 2,9$  miljoen ton gronderts per jaar word gemaak om ongeveer 11 ton goud te lewer) vorm steeds 'n integrale deel van die dorp.

In 1944 besluit die Dorpsraad egter dat nywerheidsontwikkeling nodig is vir Boksburg se vooruitgang en word daar begin met 'n program van aktiewe aansporing vir potensieële beleggers, en met die nabyheid van spoor-, lug-, en padnetwerke, sowel as die ontwikkeling en uitbouing van die infrastruktuur, ontwikkel Boksburg spoedig as nywerheidsdorp.

Something about the electricity supply:

As far as can be ascertained, it was as early as January 1905 that the Council took the first steps when it decided to purchase electricity in a direct current from a company, Messrs E H Gellender & Co., Ltd. In September of the same year, the Council took over the generating plant.

From the Mayor's Minute for the mayoral year ending 31 October 1906, which was the third year of existence of the Municipality of Boksburg, an item under the heading "Lighting Works", reads as follows:—

"From the 1st September the Boksburg Electric Co.'s plant, etc., was taken over by this Municipality, and placed under the administration of this Department.

The Plant consists of the following:—

- 2 Bellis Compound Engines, direct coupled to two G.E.Co.'s Multipolar Dynamos of 25 kilowatt capacity each.
- 2 50-Horse Power Multitubular Davey Paxman Boilers.
- 1 Berryman's Patent Water Heater.
- 3 Steam Pumps.
- 188 Street Poles, lines, etc., and sundry other minor gear and accessories.

The number of consumers of electric lights for the month of September was 117."

It is interesting to note that the charge for one kWh (unit) of

electricity, was then 1 shilling (10c). Today's charge for domestic consumers, that is some 80 year later, is 8,0c per kWh.

In November 1906, the Council accepted an offer from the Rand Central Electricity Company to supply electricity at 2 100 volts AC.

The changeover from DC to AC took place in April 1907.

In July 1907, the Rand Central Electricity Company went into liquidation and the Victoria Falls Power Company took over its assets and obligations.

ESCOM took over supply from the Victoria Falls Power Company on a National basis in December 1948.

In 1915 the Council decided to install its own generating plant to boost industrial expansion, as the Victoria Falls Power Co. was not prepared to consider a lower tariff.

However, subsequent to the contract being placed for the generating equipment, the Victoria Falls Power Co. relented and offered the Council supply at a price less than it would have cost the council to generate its own.

It appears that the equipment purchased was actually installed but never put into use.

Mr E L Smith, Boksburg's first Town Electrical Engineer, and today Honorary Member of this Association, was appointed on 1 May 1945, and it was about then that the Electricity Department became a fully fledged department. Prior to this, but for a period which is not known, the Department formed part of the Town Engineer's Department.

It is interesting and perhaps significant to note that Mr Fortmann is only the second Town Electrical Engineer of Boksburg.

In 1951 a main supply point at 11 kV was established and when the load had outgrown this supply point's capacity, a second supply point was established in 1965, at 33 kV and named the Les Smith 88/33 kV Sub-station.

Today, Boksburg also receives electricity from ESCOM at 132 kV.

Boksburg rates among the ten or eleven largest electricity undertakings of all the cities and towns in the Republic with the highest recorded maximum demand to date of approximately 180 megawatts.

Dit is vir my 'n besondere eer en voorreg om in hierdie eeuftesjaar van Boksburg en boonop nog met u Vereniging se 50ste Konvensie, u afgevaardigdes te verwelkom.

Ek hoop en vertrou dat u 'n baie vrugbare en aangename Kongres sal hê.

Baie dankie mnr die President.

## OPENINGSTOESPRAAK DEUR MNR P T C DU PLESSIS, LP, MINISTER VAN MANNEKRAG EN VAN OPENBARE WERKE EN GRONDSAKE

Mnr die President, die edelagbare burgemeesters van Kaapstad en van Boksburg, ander hoogwaardigheidsbekleërs, dames en here.

Dit is vir my 'n besondere genoë en 'n voorreg om vanoggend hier saam met u te kan wees om die vyftigste konvensie van die Vereniging van Munisipale Elektrisiteitsondernemings te open.

Dit is veral 'n eer om aan die heuglike verrigtinge van u Vereniging deel te hê, wat hom op so 'n lang geskiedenis van getroue en merkwaaardige dienslewering aan die gemeenskap kan roem – ek vernemoen dat die Vereniging al sowat twee-en-sewentig jaar oud is.

Suid-Afrika se ekonomiese vooruitgang is direk van die doeltreffende voorsiening van elektrisiteit aan die handel en

nywerheid afhanklik. As dit nie vir die versienheid van u lede was nie sou daar nie aan die groeiende vraag na elektrisiteit voldoen kon gewees het nie. U lede het egter behoeftes reg geïdentifiseer wat 'n grootse bydrae tot Suid-Afrika se ontwikkeling gemaak het, waarvoor ons u baie dank verskuldig is.

I should at the outset like to refer to my initial contact albeit indirect, with your Association, which was in the form of the record of the Proceedings of the inaugural Congress of the Association of Municipal Electrical Engineers, held in Johannesburg from 15 to 20 November 1915.

In his presidential address the first President touched on various problems encountered in municipal electrical engineering, which required consideration. His plea was that the Association



From left to right: Alderman Peter Müller, Mayor of Cape Town, Minister Pietie du Plessis, M.P., Alwin Fortmann, President of A.M.E.U., Clr Piet Buckle, Mayor of Boksburg.

should aim at the standardisation of electrical systems throughout South Africa, more particularly concentrating on voltage and frequency of supply. In this way costs could be contained as each municipality would be able to buy in the best markets properly standardised materials such as lamps, motors, etc.

The question of electricity tariff problems peculiar to every public lighting system was broached, as well as the drafting of by-laws for the licensing of electricians, with the goal of greater protection of the public. The challenge of Municipal Tramway Undertakings was also addressed.

Consideration for the consumer was also shown in the approach to meter reading. I quote: "Some municipalities have water meters, electrical meters and gas meters, and as to whether there should be separate meter readers for each department or whether one meter reader should read all municipal meters at one stand or house, be they water or electricity meters, and whether the meters should be read during a certain period of the month or over the whole month, are certainly matters in which the public generally are particularly interested."

These extracts from the records of years gone by, show that although some problems may recede, the basic ones remain and are compounded by a tremendous increase in the scale, sophistication and complexity of the systems and apparatus which have evolved.

I am told that your Association has over 350 members at more than 200 municipalities.

According to its constitution the Association is a voluntary one and has no profit-seeking motive. The objects of the Association are truly commendable and I note with appreciation that these include the aim of actively promoting the training of technical staff.

The importance of the role played by Municipal Electricity Undertakings and the service which they render is obvious as is the immense contribution which they make to improving the quality of life, although it is often taken for granted and can draw adverse publicity when things go wrong.

The functions which the Association fulfils cover a wide field of activities such as bringing about the increased standardisation of equipment in co-operation with the South African Bureau of Standards, negotiating for the best deal in the electricity tariff structure, developing training facilities in conjunction with other branches of municipal services, and so forth.

I am aware of the fact that your Association has problems, in common with all professional bodies, in acquiring and maintaining the services of top level professional people of the required calibre.

In the heavy current electrical engineering field, according to official surveys, there is a marked shortage of engineers and consequently there is strong competition for their services. The problems here, in terms of recruitment, are the familiar ones of salaries, scope for advancement and working conditions.

Job differentiation in salary structures has been mooted as a possible way of obtaining the services of suitable people. Efforts are being directed at improving the image of the profession of electrical engineering and the opportunities in the engineering and technical fields in general.

Heavy demands are being made on vocational guidance by the various occupational directions in competition for more outstanding scholars and students with the necessary potential. It is axiomatic that, through effective education and training, our available human resources can best be developed to the full.

There are loud calls for the clearer determination of priorities in the provision of incentives in various forms, to guide education and training in the desired directions. The State has endeavoured to play its part in this field, but it remains in the first instance the task of the private and other related sectors to provide the necessary training facilities and incentives to meet their specific present and future needs as effectively as possible.

Die ondersoek na kontanttoelae in die plek van belastingtoevoegings aan werkgewere wat personeel oplei of laat oplei, is reeds afgehandel en aan my voorgeleë. Die Nasionale Opleidingsraad skenk tans aandag aan die aanbevelings.

Soos u bewus is, het die registrasie van tegnisi met die totstandkoming van die Raad vir Registrasie van Tegnisi, nou 'n werklikheid geword en sal na verwagting 'n besondere bydrae tot die handhawing van standarde maak.

Vanuit owerheidsdewê is daar 'n voortdurende besinning oor hoe gedifferensieerde vergoedingsstrukture in die owerheidssektor verder uitgebou kan word met die oog op die vermoë om in die vrye arbeidsmark effektief te kan meeding. Gedifferensieerde verspreiding is reeds in 1982 in sekere beroepsrigtings ingestel en markerwante salarisstrukture vir die bestuurskader het in 1984 in werking getree.

Interessante dinge kan genoem word dat volgens die jongste gegewens die totale hoëvlakmannekrag 746 955 beloop het, waarvan 26 247 of 3,5 persent ingenieurs is, 4 804 of 0,64 persent wetenskaplikes en 93 504 of 12,5 persent tegnisi of tegnoloeë is. Die totale middelvlakmannekrag het 1 484 197 beloop waarvan 291 133 of 6,73 persent ambagsmanne en vakleerlinge is.

Wat treffend is, is die getal vakatures wat in 1985 bestaan het, naamlik 1 345 vir ingenieurs, 466 vir wetenskaplikes, 8 065 vir tegnisi en tegnoloeë en 12 597 vir ambagsmanne en vakleerlinge.

Die Verslag oor die Totale Werkverskaffing aan Hoë- en middelvlakmannekrag per Beroepsgroep, RSA, 1965 tot 1985, wys daarop dat mannekragtekorte deur die optimale aanwending van persone in beroepe waar daar tekorte bestaan verlig kan word.

Optimale benutting in hierdie konteks beteken dat personeel waarvan daar 'n algemene tekort ondervind word, hoofsaaklik aangewend sal word om dié take te verrig wat nie deur laer gekwalifiseerde persone of deur persone waarvan daar 'n voldoende aanbod is, verlig kan word nie. Voldoende ondersteunende personeel moet dus vir persone waarvoor daar 'n ooraanvraag bestaan, beskikbaar wees.

In studies oor die ingenieursberoep (Ebersohn, D-Die ingenieurs in die RSA, RGN-verslag MM-55, RGN 1975) is bevind dat sowat 19 persent van ingenieurs se tyd aan administratiewe en bestuursfunksies gewy word en dat ongeveer 30 persent van die werk van ingenieurs deur tegnisi gedoen word.

Daar is ook bevind (Terblanche, 1982) dat ongeveer 27 persent van siviele ingenieurs se werk deur persone met laer kwalifikasies gedoen word. Dit het verder uit Terblanche se studie geblyk dat die getal tegnisi per ingenieur, in veral konstruksieaansake, heelwat verhoog kan word.

'n Studie oor meganiese, elektriese en elektroniese ingenieurs (Cilliers, 1985), het daarop gedui dat sowat 30 persent van die respondentegroep se tyd vrygestel kan word indien die gedeeltes van die werk wat nie gespesialiseerde ingenieurskennis vereis nie aan die ander werknemers opgedra kan word.

Middelvlakbestuur, kommunikasie en administrasie was die ak-

tiwiteite waarop die meeste ingenieurtyd bespaar kon word. Die belangrikste rede waarom ingenieurs wel hierdie take verrig, was die gebrek aan voldoende geskikte personeel.

Mr President, ladies and gentlemen, I should now like to touch on recent developments which will have a profound effect on the future training of artisans and on in-service training in general, in which industry and commerce will have an increasingly important role to play.

Apprentices and adult trainees are employed in some 350 designated trades in 19 industries. These persons are all being trained in terms of the Manpower Training Act, 1981, under training conditions, which in spite of extensive technological development, have not undergone any comprehensive change since the mid 1940's.

The White Paper on the Investigation into the training of Artisans stipulates that the recommendations accepted by the Government are to be implemented by the Department of Manpower in consultation with the National Training Board. I should now like to refer to some of the facets of interpretation and implementation as they affect the National Training Board.

The Government accepted the recommendation that the present apprenticeship training system should be converted into a system of modular competency based institutional training coupled to controlled on-the-job training and experience. The Manpower Training Act in fact already allows for the implementation of such a system.

To ensure the gradual, evolutionary and orderly transition to the modular system, the National Training Board has prepared a report: Guidelines for the Introduction of Modular Training for Apprentices, which is at present being printed for distribution.

The Government's approach is to encourage the establishment of organisational training structures by industries so as to provide, *inter alia*, for the highest degree of devolution of power and consequently of accountability.

Many industrial councils already make provision for the establishment of training boards and/or funds, while a number of employers' organisations have also established training schemes, all with the purpose of providing to a greater extent for their training needs.

The introduction of further industry training boards is at present being actively propagated. It is the intention that such training boards should, *inter alia*, take over the administration of the apprenticeship system from the Department of Manpower for their specific industries. With the acceptance of the modular system of training for artisans, apprentices will of course in future not qualify through the effluxion of time.

The White Paper contains an important directive for the extension of the training structures to the entire spectrum of in-service training, which reads as follows:

"These recommendations (concerning structures) must be accommodated in an amended form in a simplified structure for the entire spectrum of in-service training according to the needs of employers in a specific industry."

The Government's standpoint implies that industry training boards could in future be responsible for all forms of in-service training and not only for the training of artisans.

The role of the adapted industry training boards within the proposed system, covering all in-service training can be summarised as follows:

In keeping with the Government's declared policy of minimum intervention in the affairs of the private sector, the State only takes responsibility for the creation of a legal framework within which employers and employees can operate in a meaningful and organised way to deal with all aspects of training.

What is important is that the State provides training incentives. The National Training Board has nearly finalised its investigation into the structure of tax concessions and cash grants in

order to facilitate the establishment and utilisation of off-the-job training facilities.

The conversion of tax concessions for training to a system of cash grants is set out in detail in the National Training Board publication: Guidelines for the Establishment, Management, Financing and Functioning of an Industry Training Board (within a system of cash grants and accreditation).

A properly constituted and fully representative industry training board may apply to the Department of Manpower for accreditation. The specific industry training board will then operate within its objects, powers and duties, with its executive and accreditation committees, as stipulated in its approved constitution. Various guidelines drawn up by, and available from the National Training Board, are intended to assist in this process, without being prescriptive or necessarily comprehensive.

In this way an industry training board, in drawing up its constitution, can determine its functions in accordance with the prevailing requirements and circumstances. An accredited industry training board may as a general principle accredit any training institution, organisation or training specialist who complies with given standards in a way it sees fit.

However, if it wishes to participate in the financial incentives offered by the State to promote training, an industry training board will have to follow acceptable procedures and ensure that the training organisations it accredits meet certain criteria and maintain the required standards.

Meneer die President, die Nasionale Opleidingsraad is tans by ongeveer vyf-en-twintig navorsingsprojekte oor die bevordering van opleiding betrokke: Een van hierdie navorsingsprojekte is getiteld: Tegnologiese Ontwikkeling en Opleiding.

Tegnologiese vordering in die volgende 20 jaar gaan 'n direkte invloed op die arbeidsmag in geheel, en dus ook op die opleiding en heropleiding van mannekrag uitoefen ten einde by die behoeftes van die veranderende tegnologiese wêreld aan te pas. Die vinnige tempo van tegnologiese ontwikkeling en die feit dat baie tegnologieë mekaar wedersydse beïnvloed, maak die saak meer gekompliseerd.

Tegnologieë kan in plus-minus 300 verskillende onderafdelings ingedeel word en daar sal indringend na die ontwikkeling van prioriteitstegnologieë vir die Republiek van Suid-Afrika, met die oog op langtermynbeplanning gekyk moet word. Die invloed van veranderinge in tegnologie gaan van nywerheid tot nywerheid varieer afhankende van die gesofistikeerdheid van die tegnologie en die behoefte aan geskooldeheid en heropleiding.

Daar word verwag dat op die kort-, medium- en langtermyn klemverskuiwings in die tegnologiese wêreld sal plaasvind, wat 'n invloed op die werke mannekragituusie van die land sal hê. Die omvang daarvan tree skerp op die voorgrond as in ag geneem word dat tegnologieë onder meer in die volgende hoofafdelings ingedeel kan word: kantooroutomatisasie, telekommunikasie, rekenaarondersteunde ontwerp, laser tegnologie, kwaliteitskontrole, materiaalbestuur en rekenaarsteunde vervaardiging, wat uiteraard 'n breë spektrum van beroepsvelde aansny.

Dit is derhalwe duidelik dat daar 'n behoefte is aan:

- \* 'n stelsel waarvolgens tegnologiese veranderinge in aanmerking geneem kan word vir opleiding- en mannekragbeplanningsdoelendes; en
- \* die identifisering van beroepe of beroepsgroepe wat van kritiese belang sal wees met die oog op ekonomiese, tegnologiese en maatskaplike ontwikkeling in Suid-Afrika.

Daar kan verwag word dat werkgeleenthede veral in die volgende rigtings sal toeneem, naamlik:

- die rekenaarbedryf, met die klem op hoëvlakvaardighede;
- die ingenieurswese, veral in die meganiese ingenieurswese waar elektroniese kundigheid en vaardigheid verreis word, maar eweneens in die ander vertakkinge van die ingenieurswese;
- tegniese ondersteuningspersoneel, waar tegnisi met 'n ver-

- skeidenheid vaardighede en kundigheid in die elektronika in aanvraag is;
- ambagsmanne, met multivaardighede in die elektronika; en
- toesighoudende personeel, waar die aard van die toesighoudende funksies sal verander as gevolg van tegnologiese vooruitgang.

Die Nasionale Opleidingsraad sal prioriteite moet bepaal wat tegnologiese ontwikkeling betref, in ag genome die invloed wat dit in die verskillende ekonomiese sektore het en die behoefte aan opleidingdienste, verder opleiding en heropleiding in die RSA. Die saak sal aangepak moet word in die lig van die unieke demografiese en staatkundige patroon van ons land. Haalbare

tegnologiese, ekonomiese en mannekrag modelle wat op demografiese en opleidingsmodelle berus, soos byvoorbeeld modulare opleiding, sal ontwikkel moet word.

Doelstellings soos vir watter tegnologieë daar vir die kort-, medium- en langtermyn opgelei behoort te word, hoe opgelei moet word, hoeveel opgelei behoort te word, asook die invloed wat tegnologiese ontwikkeling op werkskepping gaan hê, sal ook aangespreek moet word.

Mnr die President, ek wens u en u Vereniging graag alle sukses toe met die verrigtinge wat nou gaan volg. Dit is nou my voorreg om hierdie vyftigste konvensie as geopen te verklaar.

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**PRESIDENTIAL ADDRESS  
BY A H L FORTMANN Pr Eng  
FOCUS ON PRODUCTIVITY  
AND THE MUNICIPAL  
ENGINEER**

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**PRESIDENTSREDE  
DEUR A H L FORTMANN Pr Ing  
FOKUS OP PRODUKTIWITEIT  
EN DIE MUNISIPALE  
ELEKTROTEGNIËSE INGENIEUR**

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*Mr Alwin Fortmann delivering his presidential address to the Convention.*

**1. INTRODUCTION:**

The gross domestic product per capita (GDP) in South Africa compares extremely unfavourably with major producing countries of the world.

Basically, labour productivity is the basis of our standard of living - we cannot have more than what we produce and therefore labour productivity is a fundamental factor in the quality of human existence.

Advancement in the social and private sphere can only come from gains in output per person.

South Africa's output per capita is about one sixth of Switzerland's, one fifth of the USA's, a quarter of Japan's and a third of the UK's.

The average annual growth rate in output per capita achieved between 1972 and 1982 was 0,6% for South Africa, 1,4% for the USA, 3,0% for Japan and 1,1% for the U.K.<sup>(1)</sup>

South Africans have good reason to be deeply concerned about the low economic growth while the population growth is high.

Mention should of course also be made of the fact that al-

**1. INLEIDING:**

Die bruto huishoudelike produk per kapita (BNP) in Suid-Afrika vergelyk besonder ongunstig met die hoof vervaardigingslande van die wêreld.

Arbeidsproduktiwiteit bepaal die basis van ons lewensstandaard - ons kan nie meer hê as wat ons vervaardig nie en derhalwe is arbeidsproduktiwiteit 'n fundamewiele faktor in die kwaliteit van die mens se bestaan.

Vordering in die maatskaplike en private sfeer kan net deur 'n groter uitset per persoon bekom word.

Suid-Afrika se opbrengs per kapita is ongeveer een sesde van Switserland s'n, een vyfde van die VSA s'n, 'n kwart van Japan s'n en 'n derde van die Verenigde Koningryk s'n.

Die gemiddelde jaarlikse groei in opbrengs per kapita wat gedurende die tydperk 1972 tot 1982 behaal was, was 0,6% vir Suid-Afrika, 1,4% vir die VSA, 3,0% vir Japan en 1,1% vir die Verenigde Koningryk.<sup>(1)</sup>

Suid-Afrikanners het goeie rede om oor die lae ekonomiese groei, terwyl die bevolkingsgroei hoog is, diep besorg te wees.



though South Africa's GDP compares unfavourably with the industrialised nations, we do fare better than most, if not all of the Third World countries – this fact I believe, should not however cause complacency.

South Africa's productivity level per worker has off course increased appreciably over the years, but this has largely been negated by the exceptionally high birthrate, especially among certain population groups. You cannot have the birthrate exceeding productivity levels – no matter how high your productivity, the nett result is low productivity.

This is a problem which the engineer can hardly be expected to address except to talk about it and assist in keeping the awareness of this problem alive.

It is perhaps a problem the politicians should address – but then they may be accused of promoting their own political ends.

Health authorities are in the best position to assist and I believe that they are in fact doing this and working hard at it.

An assessment of the development and economic welfare of employees in South Africa should obviously be made against the background of growth in the country's economy and the demographic characteristics of its population.

In November 1985 the population of the RSA numbered 27,7 million, of whom 68,7% were blacks, 17,7% were whites and 10,4% and 3,2% were coloureds and asians, respectively. If the populations of Transkei, Bophuthatswana, Venda and Ciskei, referred to as the TBVC countries, are added to this number, the total population of the RSA and TBVC countries rises to 33,6 million, of whom 74,1% are blacks and only 14,6% are whites.

The growth rate of the black population in the RSA and TBVC countries of 2,8% per year is almost as high as that of Africa, which in turn is appreciably higher than the average growth rate of the population in developing countries. The growth rate in South Africa's white population of 1,6% per year is about twice as high as the figure for developed countries.

South Africa has elements of the First and Third Worlds and shares many of the problems that hamper economic progress in the rest of Africa. Rapid population growth is intensifying the economic, social and psychological problems associated with un- and under-employment, especially since it retards the prospects of those already born. It is also making tremendous inroads on state funds which are already stretched to the limit.<sup>(2)</sup>

## 2. WHAT IS PRODUCTIVITY?:

According to the official definition of the International Labour Office, productivity is defined as the ratio of the input of the various elements of production to the output derived from that input.

Therefore,

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

$$= \frac{\text{Output}}{\text{Capital} + \text{Labour} + \text{Energy} + \text{Materials}}$$

To improve productivity involves two basic approaches.

- To obtain more output with the same input.
- To obtain the same output with less input.

Management has, or should have, the knowledge and ability to organise and motivate and manage and to have a clear vision of its aims and objectives. Management therefore has the major responsibility for present and future productivity levels.

Productivity is an attitude of the mind.

A lot has been said about productivity, but nevertheless we need to address this issue again and again.

Dit kan natuurlik ook genoem word dat alhoewel Suid-Afrika se BNP ongunstig met die nywerheidslande vergelyk, vaar ons baie beter as die meeste, indien nie almal, van die derde wêreld lande – hierdie feit glo ek, behoort egter geen sinselfoelbaarheid tot gevolg te hê nie.

Suid-Afrika se produktiwiteitspyl per werker het wel oor die afgelope jare aansienlik gestyg, maar is grotendeels deur die buitengewone hoë geboortepyl teengewerk, in besonder onder sekere van die bevolkingsgroepe. Die geboortesyfer durf nie die produktiwiteitspele oorsky nie – dit maak nie saak hoe hoog die produktiwiteit is nie, die netto resultaat bring lae produktiwiteit mee.

Hierdie is 'n probleem waar daar beswaarlik van die Ingenieur verwag kan word om iets daaraan te doen, behalwe om daaroor te praat en te help om die bewuswording van die probleem aan die lewe te hou.

Dit is moontlik 'n probleem wat die politici behoort aan te spreek – maar dit mag tot gevolg hê dat hulle daarvan aangekla word dat hulle dit vir eie politieke gewin doen.

Gesondheidsowerhede is waarsynlik in die beste posisie om in hierdie opsig behulpsaam te wees en ek glo dat hulle inderdaad hieraan aandag skenk en druk daaraan werk.

'n Beraming van die ontwikkeling en ekonomiese welvaart van werkers in Suid-Afrika behoort teen die agtergrond van die land se ekonomiese groei in die demografiese eienskappe van sy bevolking gemaak te word.

In November 1985 was die bevolking van die RSA 27,7 miljoen, waarvan 68,7 swart, 17,7% blank en 10,4% en 3,2% onderskeidelik, kleurlinge en asiërs was. As die bevolking van die Transkei, Bophuthatswana, Venda en Ciskei, bekend as die TBVC-lande, bygereken word is die totale bevolking van die RSA en TBVC-lande 33,6 miljoen, waarvan 74,1% swart en slegs 14,6% blank verteenwoordig.

Die swart bevolkingsgroei in die RSA en TBVC-lande van 2,8% per jaar, is byna so hoog as dié van Afrika wat op sy beurt heelwat hoër as die gemiddelde van die groeikoerse van die bevolking in ontwikkelende lande is. Die bevolkingsgroei van Suid-Afrika se blanke bevolking van 1,6% per jaar, is ongeveer twee keer so hoog as die syfer vir ontwikkelde lande.

Suid-Afrika het elemente van Eerste- en Derde Wêreld en deel baie van die probleme wat ekonomiese groei in die res van Afrika knielhalter. Die vinnige aanwas van die bevolking vererger die ekonomiese, maatskaplike en psilogiese probleme wat gepaard gaan met werkloosheid en werkskaarste en in besonder aangesien dit die vooruitsigte van die mense wat reeds gebore is, aan bande lê. Dit maak ook inbreuk op die staat se fondse wat reeds tot die uiterste beproef is.<sup>(2)</sup>

## 2. WAT IS PRODUKTIWITEIT?

Volgens die amptelike definisie van die Internasionale Arbeidsburo, word produktiwiteit as die verhouding van die inset van die verskillende elemente van produksie, tot die uitset wat deur daardie insette bewerkstellig word, gedefinieer.

Derhalwe,

$$\text{Produktiwiteit} = \frac{\text{Uitset}}{\text{Inset}}$$

$$= \frac{\text{Uitset}}{\text{Kapitaal} + \text{Arbeid} + \text{Energie} + \text{Materiale}}$$

Om produktiwiteit te verbeter, behels twee basiese benaderings.

- Om meer uitset met dieselfde inset te behaal.
- Om dieselfde uitset met minder insette te behaal.

Bestuur beskik, of behoort oor die kennis en vermoë te beskik om te organiseer, te motiveer, te bestuur en om 'n duidelike visie van sy doelwitte te hê. Bestuur het derhalwe



### 3. THE ROLE OF MANAGEMENT IN PRODUCTIVITY:

Making resources productive is the specific job of management, as distinct from the other jobs of the 'manager': entrepreneurship and administration. The history of management as a distinct social function began over a hundred years ago with the discovery that resources can be managed for productivity. It is only managers – not nature or laws of economics or governments – that make resources productive. Resources can be made productive in the individual plant or enterprise, the individual store, the individual hospital, the individual office, the individual port, the individual research laboratory. They are made productive – or deprived of productivity – by individual managers within their own individual sphere of responsibility.

Around 1875 Frederick W Taylor discovered that work could be managed and thereby made more productive. Before Taylor, the only way to get more output was to work harder and longer. But Taylor saw that the way to get more output was to 'work smarter', that is, more productively. He saw that the productivity of work is not the responsibility of the worker, but of the manager.

Rarely, if ever, has a new basic institution, a new leading group, a new central function, emerged as fast as has management since the turn of the century.

Management is the organ of institutions, the organ that converts a mob into an organisation, and human efforts into performance.

It is top management that faces the challenges of setting directions for the enterprise, of managing the fundamentals.

Peter F Drucker found that the decline in productivity since 1960 was due to a philosophy that productivity will look after itself. Therefore, if management is not concerned with the raising or uplifting of productivity, nothing else will!<sup>(1)</sup>

The success of any organisation is largely dependent on the quality of its business management leadership. It is generally accepted that the task management has in carrying out the planning, organising, instructing, co-ordinating and control of all the multitude of activities of a business, is the main factor in productivity education. The business success and efficiency of a country is therefore by and large measured by the quality of its management.<sup>(2)</sup>

It is unthinkable to imagine a single work process within an organisation where management is not involved. In any organisation therefore, management functions are present from policy decision-making at the highest level to supervision at production level.

In the promotion and stimulation of productivity, there are numerous factors to be borne in mind.

Some of these factors are:

- Communication
- The enhancement of self-image
- Sound teamwork
- Fostering mutual respect and belonging
- Giving recognition
- Maintaining relationships on a sound and healthy footing
- Justice – creating conditions in which the worker can find security and satisfaction in working for a purpose that commands his assent as being just
- Fostering loyalty
- Good human relations
- Making workers aware of the goals of the organisation
- Getting people involved in the business
- Apply and develop personal enthusiasm
- Engendering good employee relations and guarding against too much pre-occupation with the legal aspects of industrial relations.

Each of these factors could probably form a topic for discussion, but I leave these to you to ponder over.

South Africa is endowed with rich treasures of natural resources such as gold, uranium, coal, minerals and base metals.

To put the base metals and minerals to the best possible use

die grootste verantwoordelijkheid vir huidige en toekomstige produktiwiteit.

Produktiwiteit is 'n gesindheid van die hart.

Baie is reeds oor Produktiwiteit gesê, maar des nieestaan, is dit nodig dat die aangeleentheid oor en oor bespreek word.

### 3. DIE ROL VAN BESTUUR IN PRODUKTIWITEIT:

Om hulprone produktief te maak is 'n spesifieke taak van bestuur en is te onderskei van die ander take van die bestuurder: entrepreneurskap en administrasie. Die geskiedenis van bestuur as 'n erkende maatskaplike funksie, het reeds oor 'n honderd jaar gelede met die ontdekking dat hulprone produktief bestuur kan word, begin. Dit is slegs bestuurders – nie die natuur of wette van die ekonomie of regerings nie, wat hulprone produktief kan maak. Hulprone kan produktief in die onderskeie fabriek of ondernemings, of individuele winkels, hospitale, kantore, hawens en navorsingslaboratoriums, gemaak word. Hulle word deur die onderskeie bestuurders binne hulle eie individuele sfere van verantwoordelijkheid, produktief gemaak, of van produktiwiteit ontnem.

Om en by 1875 het Frederick W Taylor ontdek dat werk bestuur, en daardeur meer produktief gemaak kan word. Voor Taylor, was geglo dat die enigste wyse waarvolgens meer uitsette bekom kon word, harder en langer werk geveg het. Taylor het besef dat meer uitsette bekom kon word, wanneer daar meer doeltreffend gewerk word, d.w.s. meer produktief gewerk word. Hy het besef dat produktiwiteit van werk nie die verantwoordelijkheid van die werker nie, maar van die bestuurder is.

Selde, indien ooit, het 'n nuwe basiese instelling, 'n nuwe leidende groep, 'n nuwe sentrale funksie, sedert die begin van die eeu, so vinnig soos bestuur, verrys.

Bestuur is die hart van 'n onderneming, die orgaan wat los enheide in 'n organisasie omskep en menslike inspanning in werkverrigting verander.

Topbestuur moet die uitdaging om rigting aan 'n onderneming se aktiwiteite te gee en die fundamentele te bestuur, die hoof bied.

Peter F Drucker het bevind dat die afname in produktiwiteit sedert 1960 toe te skryf was aan 'n filosofie dat produktiwiteit na homself sal omsien. Derhalwe, indien bestuur nie met die verbetering van produktiwiteit bemoeid is nie, sal niks anders dit bewerkstellig nie.<sup>(3)</sup>

Die welslae van enige organisasie, is grotendeels van die kwaliteit van sy bedryfsbestuur afhanklik. Dit word algemeen aanvaar dat die plig van bestuur in die uitvoering van beplanning, organisering, opdragte gee, koördinering en beheer van al die menige aktiwiteite van 'n bedryf, die hoof-faktor in produktiwiteitsonderderrig is. Die bedryfswelslae en doeltreffendheid van 'n land word derhalwe grotendeels aan die gehalte van sy bestuur gemeet.<sup>(4)</sup>

Dit is denkbaar dat daar in 'n organisasie enige werksprosesse is, waarby bestuur nie betrokke sal wees nie. In enige organisasie derhalwe, is bestuursfunksies vanaf beleidsbepaling op die hoogste vlak tot toesighouding op produksievlak, teenwoordig.

Met die bevordering en stimulering van produktiwiteit, is daar verskeie faktore wat in gedagte gehou moet word.

Sommige van hierdie faktore is soos volg:—

- Kommunikasie
- Die verbetering van jou selfbeeld
- Gesonde spanwerk
- Bevordering van onderlinge respek en deelname
- Erkenning gee
- Handhawing van gesonde verhoudings
- Regverdigheid – daargestelling van toestande waar die werker sekuriteit en tevredeheid in sy werk wat vir hom as geregtig beskou kan word, kan ervaar
- Bevordering van loyaliteit
- Goeie menseverhoudings

tional use, we will need a highly sophisticated technology and a high level of managerial skill.

Our resources of people must therefore be raised to a level of technological and managerial skill.

Again, let me stress, South Africa's most important asset is its people.

#### 4. THE ROLE OF THE ENGINEER:

How do we, the City and Town Electrical Engineers – AMEU members, if you like, figure in this sad state of affairs of low productivity.

Let us not forget that we are very much a part of the South African scene and that we also contribute to the gross domestic product (GDP) – whether it be good or bad.

The responsibilities of the engineer go much further than being the technical leader of his department. The engineer is first and foremost the manager of his department which entails being the guide in the technical field, but he must also be the administrator in charge of his department in the promotion of productivity. Management and productivity go hand-in-hand and are without doubt, linked. This fact is clear and inescapable.

Productivity, of course encompasses the training and better utilisation of the country's most important asset – its people. If we, the City and Town Electrical Engineers have a contribution to make, how then is this to be done?

Perhaps, South Africa has also relied too heavily on the export of raw materials instead of placing more emphasis on processing those raw materials and exporting completed, or partially completed products.

Having given this matter some thought, I arrived at the conclusion that we owe it to our own departments, councils and country to add our share in the improvement in productivity and in so doing contribute to our peoples' social well-being.

As I have said earlier, management and productivity are linked and therefore we engineers should strive to become managers and good ones at that.

Local authorities should also, in their own interests, guard against placing engineers in "second string" positions as this will not only be to the detriment of engineers, as local authorities will in the long run be the losers as less and less engineers will be willing to take up positions within local authorities. I am thinking here in particular of local authorities which re-organise departments, when it often appears this is done merely for the sake of re-organisation and nothing more and senior engineers, sometimes heads of departments, suddenly find themselves in servile positions.

It is inevitable that a narrowing of the span-of-control of any top executive, for example, the Town Clerk, requires a broadening of the span of knowledge of those few remaining – the Directors, with whom he has direct contact. In the circumstances of municipal activities where widely ranging services and activities are catered for, the span-of-knowledge of senior staff is already very wide and to increase this further is inviting inaccurate decisionmaking, which will ultimately result in policies and conditions that will almost certainly adversely affect all staff members who have to work under these conditions, or carry out these policies.

The status and non-recognition of engineers and in particular municipal electrical engineers is something the AMEU has repeatedly stressed as being a great concern. One of the major tasks of the AMEU is to uplift and maintain recognition and status of the electrical engineer.

We are, I believe however, largely to blame for the negative state of affairs concerning the electrical engineer.

Engineers generally are content to solve technical problems, but are reluctant to get involved in other matters concerning society.

The noted engineering philosopher, Samuel Florman, said the following:-

"Occasionally engineers are called upon to give advice,

- Werkers van die doelstellings van die organisasie bewusmaak
- Mense in die onderneming betrokke kry
- Die ontwikkeling en toepassing van persoonlike entoesiasme
- Die waaie van goeie werknemersverhoudings en die waaie teen oorbesorgdheid t.o.v die wetlike aspekte van bedryfsbetrokkinge.

Elk van hierdie punte wat hierbo genoem word, kan waarskynlik op sy eie 'n onderwerp vir bespreking vorm, maar ek los dit vir u om self daarvoor te besin.

Suid-Afrika beskik oor natuurlike hulpbronne soos goud, uraan, steenkool, minerale en onedelde metale.

Om hierdie onedelde metale en minerale tot die beste moontlik nasionale gebruik aan te wend, benodig ons 'n hooggestofistiekeerde tegnologie en 'n hoë vlak van bestuurvernuf.

Ons hulpbron, die mens, moet derhalwe tot 'n hoë tegnologiese- en bestuursvermufvlak ontwikkel word.

Weereens wil ek dit beklemtoon dat Suid-Afrika se belangrikste bate sy mense is.

#### 4. DIE ROL VAN DIE INGENIEUR:

Waar staan ons, die Elektrotegniese Stadsingenieurs – VME0 lede, in hierdie jammerlike situasie van lae produktiwiteit.

Ons moet nie uit die oog verloor nie dat ons 'n intieme deel van die Suid-Afrikaanse toneel vorm en dat ons ook tot dié bruto binnelandse produk (BBP) – of dit nou goed of sleg is, bydra.

Die verantwoordelikheede van die Ingenieur strek meer intens as om bloot die tegniese leier van sy departement te wees. Die Ingenieur is in die eerste plek die bestuurder van sy departement wat die leierskap en die tegniese veld insluit, maar ook moet hy die administrateur in beheer van sy departement wees, om produktiwiteit te bevorder. Bestuur en produktiwiteit gaan hand aan hand en die twee is sonder enige twyfel gekoppel. Hierdie feit is duidelik en nie wegredeneerbaar nie.

Produktiwiteit omvat natuurlik die opleiding en beter gebruikmaak van die land se mees belangrike bate – sy mense.

Indien ons, die Elektrotegniese Stadsingenieurs, 'n bydrae te maak het, hoe moet dit dan gedoen word?

Miskien het Suid-Afrika te veel op die uitvoer van sy grondstowwe, in plaas daarvan om meer klem op die prosessering van daardie grondstowwe en uitvoer van klaarverwerkte grondstowwe, of gedeeltelik klaarverwerkte grondstowwe, staat gemaak.

Ek het al heelwat aan hierdie saak gedink en tot die slotsom gekom dat ons dit teenoor ons eie departemente, ons stadstrate en ons land verskuldig is om ons bydrae tot die verbetering in produktiwiteit, en sodoende 'n bydrae tot die verbetering en opheffing van ons mense se maatskaplike welstand, verskuldig is.

Soos ek vroeër gesê het, is bestuur en produktiwiteit gekoppel en derhalwe behoort ons as ingenieurs daarna te strew om bestuurders, goeie bestuurders, te word.

Plaaslike Owerhede behoort ook in hulle eie belang teen die plasing van ingenieurs in "tweede beste betrekkinge" te waaie, aangesien dit nie alleen tot die nadeel van ingenieurs, maar wel op die lang duur vir die plaaslike owerhede, ook tot nadeel sal strek en hulle die verloorde sal wees, aangesien minder en minder ingenieurs bereid sal wees om betrekkinge binne plaaslike owerhede te aanvaar. Ek dink hier in besonder aan plaaslike owerhede wat departemente reorganiseer wanneer dit dikwels wil voorkom of dit bloot gedoen word omdat dit mode is en niks meer nie en senior ingenieurs, soms hoofde van departemente, hulle skielik in minderwaardige posisies bevind.

Dit is onvermydelik dat 'n vernouing van die spanwydte van beheer van enige top uitvoerende beampte, byvoorbeeld die Stadsklerk, noodwendig 'n verbreding van die span-

but giving advice is not the same thing as participating in a decision.

Our nation is run by lawyers and businessmen, bureaucrats and economists, P R men and wizards of the media.

And, if we would be honest with ourselves, we must admit that this is partly because we do not seem to care.

We do not seek positions of leadership. Most engineers are content to solve technical problems and leave the driving – the driving of society – to others."

Is this not a sad state of affairs?

When Dr Leon B Knoll received the 1985 Federation of Societies of Professional Engineers award for services to the Engineering Profession, Dr Knoll emphasised the need for engineers to equip themselves not only to deal with the world of technology, but also the world of management and community and government affairs and to make their presence felt in the broader walks of life.<sup>(5)</sup>

In an article written by Dr J C R Heydenrych in the November 1980 issue of *Engineering News*, he discussed the engineer and quoted from an American company leaflet which I think very aptly describes, by and large, the characteristics of an engineer and reads as follows:-

"Unlike the doctor his is not a life among the weak. Unlike the soldier, destruction is not his purpose. Unlike the lawyer quarrels are not his daily bread. To the engineer falls the job of clothing the bare bones of science with life, comfort and hope. No doubt as years go by people forget which engineer did it, even if they ever knew. Or some politician puts his name on it. Or they credit it to some promoter who used other people's money with which to finance it. But the engineer himself looks back at the unending stream of goodness which flows from his successes with satisfactions that few professions may know. And the verdict of his fellow professionals is all the accolade he wants."<sup>(6)</sup>

Perhaps the above characteristics are commendable, but in the process the engineer is left out in the cold and the engineer needs to involve himself in other spheres of life.

Only then will he receive wider recognition.

I wonder how many of the other professions – the doctors, lawyers, accountants – there are many more, have ever stopped to ponder what their own positions in life would have been had there not been such a thing as an engineer.

Why am I saying this about the engineer and what has this to do with productivity?

I am in fact attempting to stress that the engineer, who finds himself in a subservient position in society, must endeavour to lift himself out of this dilemma and consciously strive to get involved in other matters of society. But to do this he should channel some of his energies in gaining knowledge of the arts – history, philosophy, and economics etc., in other words, the course of study should not only be pure engineering.

This, I am convinced will make better managers of engineers and as I said earlier, management and productivity are linked. We engineers then have a leading role to play in improving productivity.

## 5. EDUCATION AND TRAINING

### 5.1 Technical Training:

It must be remembered that education and training is a life-long process.

The AMEU is actively engaged in promoting and development of technical training.

#### 5.1.1 University Training:

The Executive Council of the AMEU has approved the granting of one new bursary annually for the study of the B.Sc engineering degree to the extent of full cover for the academic fees as well as

wyde van kennis van die paar oorblywende – die direkteure met wie hy direkte kontak het, tot gevolg sal hê. In die sfeer van plaaslike owerhede, waar 'n groot verskeidenheid van dienste en aktiwiteite gedek word, is die omvang van die spanwyde van kennis van senior personeel reeds groot en indien dit nog verder uitgebrei word, sal dit net tot onakurate besluite lei, wat uiteindelik in toekomstige beleidsbepalings weerspieël sal word; dit sal seerskerlik alle personeel wat onder hierdie omstandighede beleidsbepalings moet uitvoer, nadelig beïnvloed.

Die status en nie erkenning van ingenieurs, in besonder munisipale elektrotegniese ingenieurs, is verskeie kere deur die VMEQ as 'n saak van groot kommer uitgewys. Die VMEQ beskou die ophewing van die status en erkenning van die elektrotegniese ingenieur as een van sy hooftake.

Ons is, so glo ek, grootliks te blameer vir die negatiewe stand van sake betreffende die elektrotegniese ingenieur.

Ingenieurs is oor die algemeen trede om tegniese probleme op te los, maar is teensinnig om in ander sake betreffende die gemeenskap betrokke te raak.

Die beroemde ingenieur-filosof, Samuel Florman, het die volgende gesê:-

"Occasionally engineers are called upon to give advice, but giving advice is not the same thing as participating in a decision.

Our nation is run by lawyers and businessmen, bureaucrats and economists, P R men and wizards of the media.

And, if we would be honest with ourselves, we must admit that this is partly because we do not seem to care.

We do not seek positions of leadership. Most engineers are content to solve technical problems and leave the driving – the driving of society – to others."

Is dit nie 'n droewige stand van sake nie?

Toe Dr Leon B Knoll die 1985 Federasie van Verenigings van Professionele Ingenieurs toekenning vir dienste gelewer aan die ingenieursprofessie, ontvang het, het hy die noodsaaklikheid dat ingenieurs hulleself moet toerus, nie net om tegnologiese aangeleenthede te kan hanteer nie, maar ook om bestuur, gemeenskaps- en regeringsaangeleenthede te hanteer, benadruk en om hulle teenwoordigheid in die breër sfeer van die lewe te laat geld.<sup>(5)</sup>

In 'n artikel wat deur Dr J C R Heydenrych geskryf is en wat in die November 1980 uitgawe van *Engineering News* verskyn het, het hy die ingenieur bespreek en die volgende vanuit 'n Amerikaanse maatskappypamflet, iets oor die ingenieur, wat ek meen tot 'n groot mate die karaktertrekke van 'n ingenieur omskryf, aangehaal:-

"Unlike the doctor his is not a life among the weak. Unlike the soldier, destruction is not his purpose. Unlike the lawyer quarrels are not his daily bread. To the engineer falls the job of clothing the bare bones of science with life, comfort and hope. No doubt as years go by people forget which engineer did it, even if they ever knew. Or some politician puts his name on it. Or they credit it to some promoter who used other people's money with which to finance it. But the engineer himself looks back at the unending stream of goodness which flows from his successes with satisfactions that few professions may know. And the verdict of his fellow professionals is all the accolade he wants."<sup>(6)</sup>

Moontlik is die bogenoemde karaktertrekke prysenswaardig, maar in die proses word die ingenieur opsygeskuif, terwyl dit noodsaaklik is dat hy homself met ander sere van die lewe behoort te bemoei.

Slegs dan sal hy wyer erkenning geniet.

Ek wonder hoeveel van die ander profesies – die dokters, prokureurs, rekenkundiges – daar is baie meer, het ooit gewonder wat hulle eie posisies in die lewe sou wees, as daar nie so iets soos 'n ingenieur gewees het nie.

Hoekom sê ek dit van die ingenieur en wat het dit met produktiwiteit te doen?

Inderwaarheid wend ek 'n poging aan om te beklemtoon dat

full residence fees. At present the annual amount has a ceiling of R6 5000,00.

This means that at any one time, the AMEU could be financing four B.Sc engineering degree students at different stages of each one's progress.

#### 5.1.2 Technikon and Technical Colleges:

To encourage technical training, the Executive Council of the AMEU approved merit awards to candidates at Technikon and Technical Colleges.

At Technikon, the merit awards are for the ten best municipal electrical trainees/apprentices, country wide, and are in the form of annual cash awards, each to the value of R200,00.

At Technical Colleges, the merit awards are for the ten best municipal apprentice electricians in South Africa, also in the form of annual cash awards, each to the value of R200,00

#### 5.1.3 Practical Training:

Some of the finest practical training for apprentice electricians and mechanics is offered by training centres run by a number of local authorities.

A survey conducted during 1986 by the Technical Training Committee of the AMEU indicated that the following Practical Training Centres were in operation:-

CENTRE	NO. OF APPRENTICES/TRAINÉES
East Rand (Benoni)	48
Cape Town	54
Durban	72
Johannesburg	171
Bloemfontein	20
East London	15
Port Elizabeth	21
Randfontein	10
Roodepoort	18
Rustenburg	12
Pietermaritzburg	18
Pretoria	Unknown

On the East Rand, an apprentice training centre is situated in Benoni and serves eight local authorities.

Since its inception, the pass rate of apprentices has been extremely gratifying.

Prior to the advent of the training centre, the odd apprentice would pass his trade test.

According to the records available, only approximately 14% of apprentices trained in Boksburg, passed the trade test with the first attempt.

Since its inception, the odd apprentice fails the trade test. Since 1979, when the first apprentice from Boksburg wrote the trade test, the pass rate has been 81,8%.

These figures are indicative of the pass rate experienced by most of the East Rand towns using this training centre, with an overall pass rate in excess of 79%.

This augers well, not only for local authorities, but for the country as a whole.

Cash merit awards of R250,00 each also apply to these training centres for the best apprentice attending each training centre.

die ingenieur, wat homself in 'n minderwaardige posisie in die samelewing bevind, moet poog om homself uit hierdie dilemma te verhef en bewustelik daarna moet strewende om in ander sake van die samelewing betrokke te raak. Maar om dit te kan doen, moet hy van sy energie so kanaliseer dat hy kennis van die kunste - geskiedenis, filosofie, ekonomie, ens. bekom, met ander woorde, sy studierigting moet nie tot die ingenieurswese beperk wees nie.

Ek is oortuig daarvan dat dit beter bestuurders van ingenieurs sal maak, want soos ek vroeër gesê het, bestuur en produktiwiteit is onafskeidbaar. Ons as ingenieurs, het dus 'n leidende rol in die verbetering van produktiwiteit te speel.

### 5. OPVOEDING EN OPLEIDING

#### 5.1 Tegniese Opleiding:

Daar moet onthou word dat opvoeding en opleiding 'n lewenslange proses bly.

Die VMEO is aktief betrokke in die bevordering en ontwikkeling van tegniese opleiding.

##### 5.1.1 Universiteitsopleiding:

Die Uitvoerende Raad van die VMEO ken een nuwe beurs op 'n jaarlike grondslag vir die studie van 'n B.Sc ingenieurswese graad toe en dit dek die akademiese, sowel as die inwoningskoste van 'n student. Die huidige jaarlike perk van die beurs beloop R6 5000,00.

Dit beteken dat die VMEO ter enige tyd, vier B.Sc studente op verskillende stadia van hul vorming, kan finansier.

##### 5.1.2 Technikon en Tegniese Kolleges:

Om tegniese opleiding te bevorder, het die Uitvoerende Raad van die VMEO meriete-toekennings vir kandidate aan Technikon en Tegniese Kolleges goedgekeur.

'n Landswye jaarlike toekenning van R200,00 word jaarliks as merietetoekennings, deur Tegnikon aan die tien beste munisipale elektro-tegniese leerlinge/vakleerlinge beskikbaar gestel.

Aan Tegniese Kolleges, is die meriete-toekennings vir die tien beste munisipale vakleerling elektrisiëns in Suid-Afrika, ook in die vorm van jaarlike geldelike toekennings, elk met 'n waarde van R200,00, beskikbaar.

##### 5.1.3 Praktiese Opleiding:

Van die mees uitstaande praktiese opleiding t.o.v vakleerlinge/elektrisiëns en werktuigkundiges, word deur opleidingsentrums wat deur plaaslike owerhede beheer word, aangebied.

Tydens 'n ondersoek gedurende 1986 deur die Tegniese Opleidingskomitee van die VMEO onderneem, was bevind dat die volgende Praktiese Opleidingsentrums opleiding verskaf:-

SENTRUM	HOEEVEELHEID VAKLEERLINGE
Oosrand (Benoni)	48
Kaapstad	54
Durban	72
Johannesburg	171
Bloemfontein	20
Oos-London	15
Port Elizabeth	21
Randfontein	10
Roodepoort	18
Rustenburg	12
Pietermaritzburg	18
Pretoria	Onbekend



#### 5.1.4 Management Training:

Training should and must not however be limited to the training of engineers, technicians and apprentices. Training must be ongoing and applied to everyone in the hierarchy of a local authority from the departmental head – in fact from the Town Clerk, down to the labourer.

Management and functional training are all-important and if it is ongoing, will instil in the manager's or the worker's mind a consciousness and enthusiasm of wanting to do things better, improving skills and of course improving productivity.

On enthusiasm, Lytton said:-

"Nothing is so contagious as enthusiasm; it moves stones, it charms brutes. Enthusiasm is the genius of sincerity and truth accomplishes no victories without it".

There are many courses available on management and productivity and local authorities would be well advised to constantly offer these to their employees.

Let me use the following analogy:-

The professional sportsman is someone who follows a strict training programme in an effort to better his own previous achievement.

The athlete trains to better his previous best time. Therefore the programme is designed with a specific goal in mind and the results of the training programme are measured by his achievements or results.

I believe that a similar drive and determination as that present in the professional sportsman should be cultivated in the worker so that he becomes aware of his achievements in his work situation so that a drive is kindled in him which strives to improve – to do better than before.

Management must therefore see to it that standards are set and that workers are evaluated against these standards on a continuous basis.

One way of achieving this end, is to continually train, coach and motivate the worker. This is why courses on management, productivity etc. should be offered on an on-going basis.

#### 5.2 Systems and Procedures:

Training and development of personnel is not always the main solution in overcoming low productivity. Therefore systems, procedures and equipment, must also be taken into account.

The selection of management courses must therefore make provision for the evaluation and restructuring of systems, procedures and equipment. The main theme must, therefore, be "work smarter not necessarily harder".

Management by Objectives is an example of such a management tool which will enable managers to improve their unit's productivity because it is – "a process whereby the superior and the subordinate of an organisation jointly identify common goals, defining the individual's area of responsibility and the results expected of the individual and using the measures as guidelines for operation purposes and assessing each member's contribution."<sup>(7)</sup>

The gap between the norm and the output of an individual, needs to be constantly measured to determine his performance. The difficulty is in perfecting the art of being able to quantify the energy expended in what we do and I consider this to be the difficult part, but it must be done, because only those managers will be able to de-

Aan die Oos-Rand, bestaan daar 'n vakleerling-opleidingsentrum wat in Benoni geleë is wat agt plaaslike owerhede bedien.

Sedert die stigting van dié opleidingsentrum, is die slaagsyfer van vakleerlinge besonder bevredigend.

Voor die totstandkoming van die opleidingsentrum, het slegs enkele vakleerlinge hulle ambagstoets geslaag.

Volgens beskikbare rekords, was die slaagsyfer slegs ongeveer 14% van vakleerlinge wat opleiding te Boksburg ondergaan het en wat ambagstoets met hul eerste poging geslaag het.

Sedert die totstandkoming van opleidingsentrums, is daar slegs enkele vakleerlinge wat nie die ambagstoets geslag het nie. Sedert 1977, toe die eerste vakleerling van Boksburg sy ambagstoets geskryf het, is die slaagsyfer 81,8%.

Hierdie syfers is 'n aanduiding van die slaagsyfer aan die meeste van die Oos-Randse dorpe wat van opleiding aan hierdie opleidingsentrum aan die Oos-Rand gebruik maak en toon 'n algemene slaagsyfer van meer as 79%.

Hierdie voorspel 'n blink toekoms, nie net vir plaaslike owerhede nie, maar ook vir die land as 'n geheel.

Kontant merietetoekennings van R250 elk, is ook van toepassing op gemelde opleidingsentrums, t.o.v. die beste vakleerling wat by elk van hierdie opleidingsentrums opgelei word.

#### 5.1.4 Bestuursopleiding:

Opleiding behoort nie net tot die opleiding van ingenieurs, tegnici en vakleerlinge beperk te wees nie. Opleiding moet deurlopend wees en moet op almal in die hiërargie van plaaslike owerhede, van die Departementshoof – eintlik van die Stadsklerk af, tot by die arbeider, toegepas word.

Bestuurs- en funksionele opleiding is baie belangrik en indien dit deurgaans toegepas word, sal dit in die bestuurder of die werker se gemoed 'n bewustheid en entoesiasme, om dinge beter te wil doen, kweek en sal dit bekwaamheid asook produktiwiteit in die hand werk.

Oor entoesiasme, het Lytton die volgende gesê:-  
"Nothing is so contagious as enthusiasm; it moves stones, it charms brutes. Enthusiasm is the genius of sincerity and truth accomplishes no victories without it".

Daar is baie kursusse oor bestuur en produktiwiteit beskikbaar en plaaslike owerhede word aangeraai om voortdurend dergelike kursusse aan hul werknemers, aan te bied.

Ek analiseer graag my stelling soos volg:-

Die professionele sportman is iemand wat 'n streng oefenprogram volg in 'n poging om sy vorige prestasie te verbeter.

Die atleet oefen om sy beste vorige tyd te oortref. Derhalwe word die program met 'n spesifieke doel in gedagte ontwerp en die resultate van die oefenprogram word gemeet aan die hand van sy resultate.

Ek glo dat 'n soortgelyke dryfkrag en vasbeslotenheid, soos wat in die professionele sportman teenwoordig is, ook in die werker gekweek moet word sodat hy van sy prestasies in sy werksituasie bewus word en sodoende 'n dryfkrag in hom ontken word wat sal meebring dat hy graag wil verbeter om meer as voorheen te vermag.

Bestuur moet derhalwe standaarde daarstel en toetsen dat werkers teen hierdie standaarde op 'n deurlopende basis ge-evalueer word.



termine the standard of their management and the training needs of their subordinates.

To prove that it can be done for an Electricity Undertaking, I have taken, as an example, the objectives and standards, as set by the City Electrical Engineer of East London. The Key Objective and Standards of the Electricity Undertaking of East London are as follows:-

#### “KEY OBJECTIVE

The Key Objective of the City Electrical Engineer is to manage professionally the Electrical Undertaking of the City of East London so as to ensure the availability of supplies of electricity to existing and new domestic, commercial and industrial consumers in the Undertaking's area of supply at acceptable cost and at equitable rates and at the highest attainable standards of performance of personnel and equipment.

#### KEY STANDARDS

The Key Objective will have been successfully achieved when the following Key Standards are met:

##### 1. Growth and Sales:

- An annual forecast of load growth and increased sales of electricity of 4,0% for the next three year period.
- The maintenance of an annual Load Factor above 60,0%.
- Consumer peak demands are monitored and controlled by means of electricity tariffs, methods of pricing and load control and management systems and the encouragement of energy conservation and management in industrial, commercial and domestic installations.

##### 2. Financial:

- A contribution from the Electricity Trading Service to the Council's Rate and General Services Fund of 7,00% of the Total Income of the Electricity Trading Service per annum for the next three year period.
- Forecasts of the Capital and Revenue Expenditure for the Electricity Trading Service and expenditure of the funds allocated each year.
- The operating ratio of annual income to expenditure is maintained at 1,08%.
- The Electricity tariffs of the Undertaking are so formulated, modified and revised as to be commercially sound, fair and equitable and recover the Undertaking's costs with minimum cross-subsidisation between rates for the various consumer groups and produce a surplus of income over expenditure of 7,00%.

##### 3. Service:

- Supply outages/interruptions quantified in the total number of consumer hours lost annually does not exceed 40 000.
- The standards of reliability of supplies to consumers does not exceed the recommended international minimum standards of reliability for the established load categories for the electricity supply industry.
- The ratio of recorded complaints from consumers to the total number of consumers does not exceed 7,00%.

Een manier om hierdie doel te bereik, is om deurlopende opleiding te verskaf en sodoen die werker te motiveer. Dit is derhalwe nodig dat kursus oor bestuur, produktiwiteit, ens. op 'n deurlopende basis aangebied word.

##### 5.2 Stelsels En Prosedures:

Opleiding en ontwikkeling van personeel is nie altyd die antwoord ten einde lae produktiwiteit te oorbreg nie. Derhalwe moet stelsels, prosedures en toerusting, ook in berekening gebring word.

Die keuring van bestuurskursusse moet derhalwe vir die evaluering en struktureering van stelsels, prosedures en toerusting, voorsiening maak. Die hoofmeta moet derhalwe wees – om meer doeltreffend en nie noodwendig harder te werk nie.

Doelmatige bestuur is 'n voorbeeld van 'n bestuurs-hulpmiddel wat die bestuurder in staat sal stel om die eenheid se produktiwiteit te verbeter, aangesien dit – “a process whereby the superior and the subordinate of an organisation jointly identify common goals, defining the individual's area of responsibility and the results expected of the individual and using the measures as guidelines for operation purposes and assessing each member's contribution.”<sup>(7)</sup>

Die gaping tussen die norm en die uitset van 'n individu, moet gedurig aan die hand van die individu se resultate gemeet word, om sodoen sy werklike prestasie te bepaal. Die grootste probleem ontstaan eger in die verpelmaking van die kuns om die energie wat ons gebruik, in dit wat ons doen, te kwantifiseer en dit glo ek is die moeilikste; maar dit moet gedoen word, want slegs daardie bestuurders sal in staat wees om die standaard van hulle bestuur en die opleidingsbenodigdhede van hulle ondergeskiktes te bepaal.

Om te bewys dat dit in 'n Elektriesiteitsonderneming prakties moontlik is, het ek as voorbeeld die doelstellings en standaarde, soos deur die Elektrotegniese Stadsingenieur van Oos-London bepaal, geneem. Die hoofdoelstelling en standaarde van die Elektriesiteitsonderneming van Oos-London, is soos volg:-

#### “KEY OBJECTIVE

The Key Objective of the City Electrical Engineer is to manage professionally the Electrical Undertaking of the City of East London so as to ensure the availability of supplies of electricity to existing and new domestic, commercial and industrial consumers in the Undertaking's area of supply at acceptable cost and at equitable rates and at the highest attainable standards of performance of personnel and equipment.

#### KEY STANDARDS

The Key Objective will have been successfully achieved when the following Key Standards are met:

##### 1. Growth and Sales:

- An annual forecast of load growth and increased sales of electricity of 4,0% for the next three year period.
- The maintenance of an annual Load Factor above 60,0%.
- Consumer peak demands are monitored and controlled by means of electricity tariffs, methods of pricing and load control and management systems and the encouragement of energy conservation and management in industrial, commercial and domestic installations.

##### 2. Financial:

- A contribution from the Electricity Trading Service to the Council's Rate and General Services Fund of 7,00% of the Total Income of the Electricity Trading Service per annum for the next three year period.

#### 4. Statutory:

- (a) The statutory requirements in respect of all Acts, Regulations and By-Laws governing the supply of electricity to consumers by a municipal electricity undertaking have been met.

### CRITICAL OBJECTIVES

#### C.0.1.0. PLANNING

To ensure the development and maintenance of an effective and logical system of short and long term forecasting of electricity load and sales growth, budgeting and networks planning, development and maintenance so that an annual surplus of 10,0% of total assets is achieved."

#### 6. CONCLUSION:

- 6.1 Measurements on a macro scale are relatively easy to carry out, so this is where a start could be made and such a shame gradually expanded to the micro level.
- 6.2 A practical way to move from the macro scale to the micro level, is to develop a performance model for every unit of the applicable undertaking.
- 6.3 Following is an example of such a performance model.

##### 6.3.1 Aims of the performance model:

- 6.3.1.1 To provide a performance model for management for all levels of the organisation with which the performance indexes can be continuously measured on a monthly and yearly basis.

Every unit is therefore compared with itself.

Goals and objectives are thus determined for every unit, by top management on a participating basis with the unit's management.

##### 6.3.2 Period:

- 6.3.2.1 The time period for the completion of the monthly performance index stretches from the first day of a month, to the last day of the same month and is for a period of twelve months, commencing on the 1st of July of every year.

##### 6.3.3 Aim of every unit:

- 6.3.3.1 The objective or goal must be seen as the mission of the respective unit, viz, what do I want to do or what do I want to achieve with the unit concerned.

##### 6.3.4 Function/Service levels:

- 6.3.4.1 After the goal of each unit has been determined, the functions required to achieve the goal, must be determined.

After the functions have been identified, the required service levels must be determined, that is, the frequency with which the function must be carried out - for example, must the grass be cut once monthly or once weekly.

##### 6.3.5 Performance indicators:

- 6.3.5.1 After the functions and performance indicators of every unit have been determined, they must be analysed so that it can be established which inputs (capital, labour, equipment, material, raw materials, time, knowledge) are required to carry out a specific function against a predetermined norm (effectivity, quality, quantity).

- (b) Forecasts of the Capital and Revenue Expenditure for the Electricity Trading Service and expenditure of the funds allocated each year.
- (c) The operating ratio of annual income to expenditure is maintained at 1,08%.
- (d) The Electricity tariffs of the Undertaking are so formulated, modified and revised as to be commercially sound, fair and equitable and recover the Undertaking's costs with minimum cross-subsidisation between rates for the various consumer groups and produce a surplus of income over expenditure of 7,00%.

#### 3. Service:

- (a) Supply outages/interruptions quantified in the total number of consumer hours lost annually does not exceed 40 000.
- (b) The standards of reliability of supplies to consumers does not exceed the recommended international minimum standards of reliability for the established load categories for the electricity supply industry.
- (c) The ratio of recorded complaints from consumers to the total number of consumers does not exceed 7,00%.

#### 4. Statutory:

- (a) The statutory requirements in respect of all Acts, Regulations and By-Laws governing the supply of electricity to consumers by a municipal electricity undertaking have been met.

### CRITICAL OBJECTIVES

#### C.0.1.0. PLANNING

To ensure the development and maintenance of an effective and logical system of short and long term forecasting of electricity load and sales growth, budgeting and networks planning, development and maintenance so that an annual surplus of 10,0% of total assets is achieved."

#### 6. GEVOLGTREKKING:

- 6.1 Metings op die makroskaal is betreklik maklik uitvoerbaar en as sulks is dit hier waar aanvoerwerk beskikbaar is kan word om 'n dergelike skema geleidelik uit te brei tot op die mikrovlak.

- 6.2 'n Praktiese wyse hoe om van die makroskaal na die mikrovlak te beweeg, is om 'n prestasiemodel vir elke eenheid van die betrokke onderneming te ontwikkel.

- 6.3 Die volgende is 'n voorbeeld van so 'n prestasiemodel.

##### 6.3.1 Doelwit van die prestasiemodel:

- 6.3.1.1 Om 'n prestasiemodel waarmee 'n eenheidsprestasiendeeks, op 'n deurlopende grondslag maandeliks en jaarliks, vir bestuur daargestel kan word, op alle vlakke te voorsien.

Elke eenheid word derhalwe met homself vergelyk.

Doelwitte word dus deur topbestuur op 'n deelnemende basis met eenheidsbestuur vir elke eenheid bepaal.

##### 6.3.2 Tydperk:

- 6.3.2.1 Die tydperk t.o.v. die voltooiing van die maandelike prestasiendeeks, strek vanaf die eerste dag van 'n maand, tot die laaste dag van die betrokke maand, vir 'n tydperk van twaalf maande en wat op die eerste Julie van elke jaar 'n aanvang neem.

##### 6.3.3 Doel van elke eenheid:

An element is therefore the input-result relationship of a function.

It must however always be remembered that a function can be broken down into various elements.

It is therefore necessary that every appropriate element be identified, so that total achievement can be established, because if an appropriate element is left out and not measured, the improvement of another element can lead to a weakening of the excluded unmeasured element, with a resultant detrimental effect on the overall achievement.

For example, after a 10% reduction of personnel had been instituted, it was found that due to mechanisation, the manufacturing costs to make one cement block increased by 12%.

- 6.3.5.2 To enable meaningful transformation of each element into an achievement index, the appropriate factors which can provide the input-result relationship, must be determined.

A formula is therefore required for each element to identify the input and the result factors.

- 6.3.5.3 Assume the number of accidents for every 1 000 km travelled to be identified as an element, then the number of accident reports of the specific task can be viewed as the **result** and the total number of kilometers travelled by the vehicles of the unit, as the **input**.

The following formula can then be used for the element:-

$$\frac{\text{Number of accident reports of the appropriate unit}}{\text{Total number of kilometers travelled by the vehicles in the unit}} \times \frac{1\ 000}{1}$$

#### 6.4 Objectives:

- 6.4.1 The annual objectives of the achievement model enable the unit's members and departmental manager concerned, to draw up an objective and method with which the objective can be achieved, for each identified achievement index element, as contained in the factors of the achievement indicator index.

This also enables management to determine an estimated time factor and to control this time factor.

Ladies and Gentlemen, I hope that my address has gone some way to spurring an awareness in the engineering fraternity, to being desirous in improving managerial skills and more importantly - productivity.

Thank you for listening to me.

#### REFERENCES

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2. AN ASSESSMENT OF THE DEVELOPMENT AND WELFARE OF EMPLOYEES IN THE REPUBLIC OF SOUTH AFRICA: Bureau Of Market Research - University Of South Africa.
3. MANAGING IN TURBULENT TIMES: Peter Drucker.
4. PRODUKTIEWEIT EN WERKSTUDIE: Prof W P Van Niekerk - University Of Port Elizabeth.
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6. ENGINEERING NEWS: November 1980.
7. PRACTICAL MBO: CIM Deltak.

- 6.3.3.1 Die doel moet as die missie van die betrokke eenheid gesien word; wat wil ek doen of wat wil ek met die betrokke eenheid bereik.

#### 6.3.4 Funksie/Dienspele:

- 6.3.4.1 Nadat die doel van elke eenheid bepaal is, moet die funksies wat uitgevoer moet word om die doel mee te bereik, geïdentifiseer word.

Nadat die funksies geïdentifiseer is, moet die nodige dienspele bepaal word, d.w.s hoe dikwels die betrokke funksie uitgevoer moet word - moet die gras eenmaal per maand of eenmaal per week gesny word.

#### 6.3.5 Prestasieaanwysers:

- 6.3.5.1 Nadat die funksies en dienspele vir elke eenheid bepaal is, moet dit ontleed word om sodoevas te stel welke insette (kapitaal, arbeid, toerusting, materiaal, grondstowwe, tyd, kennis) gelewer moet word teneinde die spesifieke funksie teen 'n bepaalde norm (effektiwiteit, kwaliteit, kwantiteit) uit te voer.

'n Element is derhalwe die inset-resultaat-verhouding van 'n funksie.

Daar moet egter altyd in gedagte gehou word dat 'n funksie in verskeie elemente opgebreek kan word.

Dit is dan ook nodig dat elke toepaslike element geïdentifiseer moet word, sodat totale prestasie verkry kan word, want indien 'n toepaslike element uitgelaat word en nie gemeet word nie, kan die verbetering van 'n ander element lei tot die verswakking van die ongemete element, met die gevolg dat totale prestasie daardeur nadeel word.

As gevolg van meganisering, is daar byvoorbeeld bevind dat om een sementblok te vervaardig met 'n 10% vermindering van personeel, die koste met 12% gestyg het.

- 6.3.5.2 Om elke element sinvol in 'n prestasie-indeks te omskep, moet die betrokke faktor wat die element se inset-resultaat-verhouding bepaal, geïdentifiseer word.

'n Formule word dus vir elke element benodig om aan te toon welke faktor as die inset- of resultaatfaktor geag word.

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'n Formule word dus vir elke element benodig om aan te toon welke faktor as die inset- of resultaatfaktor geag word.

- 6.3.5.3 Gestel die aantal ongelukke per duisend kilometer afgelê, word as 'n element geïdentifiseer, dan kan die aantal ongelukverslae van die betrokke eenheid as **resultaat**, en die totale aantal kilometer deur voertuie van die eenheid afgelê, as **inset** geneem word.

Die volgende berekening kan dan as 'n formule vir die element opgestel word:-

$$\frac{\text{Aantal ongelukverslae van die betrokke eenheid}}{\text{Totale aantal kilometer deur voertuie van die eenheid afgelê}} \times \frac{1\ 000}{1}$$

6.4.1 Die jaarlikse doelwitstelling van die prestasie-model stel die betrokke eenheids- en departementele bestuurder in staat om vir elke geïdentifiseerde prestasie-aanwysingselement, soos in die faktore van die prestasie-aanwysing indeks vervat, 'n doelwit en die metode waarmee die doelwit bereik kan word, op te stel.

Dit stel bestuur ook in staat om 'n tydfaktor te bepaal en te beheer.

Dames en here, ek hoop en vertrou dat my rede tot aansporing in die ingenieursgemeenskap, die begerigheid aangewakker het om die bestuursbekaamhede en meer belangrik - produktiwiteit te wil verbeter.

Dankie dat u na my geluister het.

#### G HEYDENRÏCH: MIDDELBURG TVL.

Meneer die President, baie dankie vir die geleentheid om te antwoord op u presidentsrede. Vergun my egter om u eers van harte geluk te wens met die hoë amp wat u in ons Vereniging beklee, in besonder omdat ons persoonlike kennismaking reeds terugdateer uit die jare voordat ons die munisipale wees betree het. Ek weet ook dat u hierdie amp met waardigheid sal beklee.

Mnr die President, die tema wat u vir u presidentsrede gekies het, is vandag net so aktueel as wat dit 19 jaar gelede was, toe "Produktiwiteit in Munisipale Elektriese Ondernemings" die tema van die 1968-Tegniese Vergadering te Vanderbijlpark was. Die eksterne omstandighede wat produktiwiteit beïnvloed, het egter sedertdien aansienlik verander soos bewys deur die kommer wat by daardie vergadering uitgespreek was dat die inflasiekoers 'n ongehoorde vlak van 4% bereik het!

Dit was daarom gepas dat u die onderwerp opnuut op die voorgrond bring, veral omdat produktiwiteit, soos u tereg aanhaal, "'n gesindheid van die hart" is, wat voortdurend gehandhaaf en uitgeleef moet word om volgehoue resultate te behaal.

Juis omdat dit "'n gesindheid van die hart" is die belangrikste enkele aspek van produktiwiteit sekerlik die stimulerende en motiverende van almal wat daarby betrokke is. Sonder hierdie innerlike dryfkrag kan geen eksterne maatreëls suksesvol wees nie. Daarom moet groot klem gelê word op die beginsel van deelneemende bestuur waardeur die bydrae van elke vlak van personeel erken en aangemoedig word, sodat die bereiking van produktiwiteitsdoelwitte 'n spanning word.

Omdat arbeidsproduktiwiteit egter slegs een van die komponente van die hele produktiwiteitsveld uitmaak, kan die ander hulbronne allermins buite rekening gelaat word. In hierdie verband is die jongste statistiek wat deur die Nasionale Produktiwiteitsinstituut vrygestel is, insiggewend.

Dit toon naamlik aan dat, alhoewel arbeidsproduktiwiteit gedurende die afgelope tien jaar toeneem het, die vermindering oor dieselfde tydperk in masjineriegebruik, 'n netto daling in produktiwiteit tot gevolg gehad het. Dit is 'n belangrike faktor wat met die ontwerp van elektriese verspreidingsroosters vir toekomstige uitbreiding, deeglik in ag geneem sal moet word.

U het in u presidentsrede die belangrike rol wat bestuur in produktiwiteit speel, uiteengesit. In die mate waarin organisasie en ondernemings groei en in gesofistikeerdheid toeneem, word al hoe groter eise aan topbestuur gestel. Dit is egter ongelukkig so dat nie alle suksesvolle ingenieurs noodwendig goeie bestuurders is nie, omdat ingenieurswese en bestuurswese twee aparte dissiplines is wat elkeen sy eie eise aan die vaardigheid en aanleg van die individu stel.

Soos u tereg opmerk, sal ingenieurswese in die algemeen en elektro tegniese ingenieurswese in die besonder veel swakker daaraan toe wies indien die bestuursfunksie hom ontnem so word omdat dit laasgenoemde funksie is wat die hoogste aansien geniet. In die sakewêreld word spesialiesbestuurders aan die hoof van ingenieursnywerhede aangestel en in die plaaslike bes-

1. PRODUCTIVITY FOCUS: Saamgestel en gepubliseer deur die Nasionale Produktiwiteit Instituut - 1984.
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7. PRACTICAL MBO: CIM Deltak.

tuursgebied word bestuurders toenemend tussen die vlak van die Stadsleier en tradisionele departementshoof geplaas.

Hierdie neiging behoort die lede van hierdie Vereniging aan te spoor om groter aandag aan bestuursbeginsels en bestuursopleiding te gee, en sodoende te verseker dat die elektro tegniese ingenieur nie net 'n hulpmiddel van bestuurswese word nie, en dat die spreekwoordelike stert die hooë begin swaai nie.

Mnr die President, ek stel dus hiermee 'n mosie van dank voor, vir die deeglike studie wat u van hierdie baie breë onderwerp gemaak het en vir die nuwe besef van die noodsaaklikheid van hoë produktiwiteit wat u met u voortrefflike presidentsrede tuisgebring het.

#### MR PAUL VAN NIEKERK: NEWCASTLE

Mr President, I too, wish to convey my sincerest congratulations to Mr Fortman as our newly elected and well deserving President of the AMEU.

It is indeed an honour, Mr President, for me to have this opportunity to convey my humble thoughts on your awe inspiring and thought provoking inaugural address.

It is evident that Mr Fortman's address involved a great deal of research, but having studied previous papers which were authored by him for this, and other prestigious institutions and organisations, it is typical of his thoroughly professional approach.

I can only agree with Mr Fortman - South African productivity has not only reduced, we have in fact gone backwards in the period from 1961 to 1985 when South Africa added resources of 94% and production gains were a mere 6%; Compared to Japan in the period 1953 - 1985 when added resources of 55% resulted in massive production gains of over 45%.

Clearly, as Mr Fortman points out, the Municipal Engineer, in an Executive position, is responsible for the efficiency of his unit which directly contributes to productivity by means of solving problems of personnel, organisation, procedures and methods.

It is incumbent on management to  
 "Do the right thing"  
 while it is expected of subordinates to  
 "Do the thing right"

It is therefore essential that the successful Town Electrical Engineer should be a good Manager - He should concentrate at least 90% of his time and energy into managing activities of others, while the remaining 10% should be used for technical aspects of the position; Thus eliminating the time honoured adage of the "baggage syndrome" whereby managers tend to carry certain technical aspects of previous positions to their new position instead of utilization of judicious delegation.

This, Mr President, brings me to another very important point which you made in your address, namely Management Training.



Our Universities and Technicians offer a number of excellent Management training courses which will be most useful to the Municipal Engineer, and can only improve his status and provide recognition. This improved status will reduce the long term shortage of Municipal Engineers by making this career path more attractive for young Engineers to follow, thereby improving future productivity in Municipal Electrical Undertakings.

## CONFERMENT OF HONORARY MEMBERSHIP TOEKENING VAN ERELIDMAATSKAP

### MR KEN MURPHY: SOMERSET WEST

### MR D C PALSER

Mr President, distinguished guests, ladies and gentlemen it is my privilege and pleasure to propose that honorary membership be conferred upon *Dennis Charles Palsler*, retired city electrical engineer of Cape Town, who has rendered exceptional service to the AMEU and by his example, conduct and engineering proficiency enhanced the status of municipal electrical engineers.

Dennis was a pupil of the Rondebosch Boys High up to Junior Certificate level after which he matriculated at the Cape Technical College and was awarded the Junior Medal for Merit.

After having spent three years as a technician apprentice with the Post Office he was released from his contract to enable him to pursue his studies at the University of Cape Town. So he's an Ikey you Maties!

In 1950 Dennis graduated having obtained a B.Sc. degree in electrical engineering with distinction and been awarded the City of Cape Town's gold medal for the best final year engineering student.

Dennis is a Professional Engineer; a Chartered Engineer UK; a Fellow of the Institute of Electrical Engineers (London); a Member of the SA Institute of Electrical Engineers and of the Institute of Certificated Engineers. He is also an Associate Member of the S.A. Institute of Management and a Fellow of the British Institute of Management.

Mr President, Dennis Palsler's academic achievements and career with the Cape Town City Council which spans 34 years is every young man's dream. He rose through the City's electrical engineering ranks from Pupil Engineer to City Electrical Engineer in 1974, a position he held for twelve years.

During this time he was responsible for the submission of a number of detailed economic and viability study reports to his Council of which the 180 MW Steenbras Hydroelectrical pumped storage scheme probably lies nearest to his heart as he had to persuade Council to proceed with the scheme, the first of its kind in Africa, against a largely negative report from ESCOM at that time. The pumped storage scheme has been in successful commercial operation for six or more years now and has proven to be even more economically viable than originally anticipated.

Dennis takes a particularly keen interest in engineering economic studies, load management, energy conservation including solar energy and electricity tariffs.

It thus came as no surprise that after presenting his paper "An Introduction to Engineering Economics" to the 47th AMEU Convention in Durban 1981, that he was subsequently appointed by the Executive Council to undertake a national survey of electricity tariffs with a view to establishing guidelines for a standard electricity tariff structure conforming to sound economic principles. Needless to say the report he presented was accepted by the Executive Council and the guidelines contained therein recommended for adoption by all member undertakings.

Dennis has served on a number of AMEU Committees during

Finally Mr President, I believe your address today was very topical, and certainly to be valued for its inspiration.

It therefore gives me great pleasure to second the motion of thanks to the President for his most interesting address.



*Honorary Members: John Dawson, Uitenhage; Denis Fraser, Durban; Alewyn Burger, Pretoria; Dennis Palsler, Cape Town.*

his years as member of the Executive Council giving the AMEU the benefit of his considerable experience and learning as an engineer who has visited virtually every country we trade with on study tours on behalf of his Council.

He served on the University of Cape Town's Electrical Engineering Advisory Board from its inception some years ago until his retirement last year.

Mnr. die President, dit is egter veral op die plaaslike vlak tussen ons ingenieurs van kleiner ondernemings in die Goeie Hoop Tak van die Vereniging waar Dennis sy plek in die ware tradisie van die VMEO vol gestaan het. Hy was een van ons, het gedien as takvoorsitter en was te alle tye gereed om te help, die kundigheid van sy personeel tot ons beskikking te stel of die saak van die kleiner ingenieur te verdedig.

Mnr. die President, geagte kongresgangers dit is dus met genoë dat ek voorstel dat ere-lidmaatskap van die Vereniging van Munisipale Elektriese Ondernemings aan *Dennis Charles Palsler* toegeken word.

### MR D C PALSER

Mnr. die President, eregaste, dames en here.

Eerstens wil ek aan Ken Murphy sê, baie dankie vir al die mooi woorde!

Aan u Mnr die President, en al die lede van die Uitvoerende Raad en al my kollegas wat vandag hier teenwoordig is, wil ek sê baie dankie vir die besondere groot eer wat u vandag aan my bewys het.

My earliest contact with the AMEU goes back nearly thirty years; to 1958 in fact, when one of my predecessors in office, Chris Downie, was elected President here in Cape Town. As a young engineer at the time I clearly recall assisting with the tape recording of the proceedings of this convention. I also have vivid memories of some of the fiery characters of those early days, such as the late Reg Kane of Johannesburg and his strongly expressed views on electricity tariffs!

More recently, I recall the 1971 Convention in Cape Town -



which incidentally I attended as an unofficial observer-when Jules van Ahlften of Springs was elected President. This was a most memorable convention for me for it was at the final dinner-dance at the Mount Nelson hotel that I met my wife, Diana-which she was attending with, of all people believe it or not, her brother! So you can see, Mr President, I owe the AMEU a lot!

But my really close association with the AMEU, however, began only in 1974 with my appointment as City Electrical Engineer of Cape Town.

During the ensuing twelve years I have been fortunate in making many close friends, not only from amongst the ranks of municipal electrical engineers, but including also councillors, affiliates and their wives.

Over the years I have watched with keen interest the AMEU's well deserved growth both in strength and stature, and its long overdue national recognition, which culminated recently with the appointment of an AMEU representative to the newly constituted Electricity Council of Escom.

I can truly say that I am very proud indeed to have been so closely associated with the AMEU.

In conclusion, Mr President, I would once again thank you most sincerely for this singularly high honour that you have conferred upon me today. I would assure you it is greatly appreciated.

#### MR W BARNARD: HONORARY MEMBER

#### MR ALEWYN PETRUS BURGER

Entered local government service in 1948 when appointed from Johannesburg Bar as legal adviser by Springs Town Council.

While serving articles prior to 1948 he took special interest in the law relating to electricity supply of which he later did a full analysis for the dissertation required for his L L M degree.

The local authorities served by him certainly benefited from his knowledge, e g Springs, as far as its area of supply was concerned.

While legal adviser at Springs, he was appointed as Honorary Legal Adviser of the AMEU. He held this appointment in a formal sense until 1960. Thereafter he, however, continued his association with the AMEU, still giving legal advice when approached from time to time. This continued even when he was Town Clerk of Johannesburg and thereafter.

Over the years he has also given legal advice to several local authorities which asked his opinion on legal problems relating to electricity supply.

In May 1963 he read a paper at the Margate Convention dealing with certain aspects of the statutes relating - Electricity supplies liability for damages.

#### CAREER DETAILS

- 1948 - 1953 *Legal adviser Springs*
- 1953 *Deputy Town Clerk, Springs*
- 1954 - 1964 *Town Clerk, Parow Municipality*
- 1964 *Assistant Registrar of S A Medical and Dental Council*
- 1965 - 1968 *Clerk of the Council, Johannesburg*
- 1968 - 1984 *Town Clerk, Johannesburg*
- 1984 - 1987 *Citizen's Consultant, Johannesburg, under three years contract*
- 1971 - 1973 *President, Institute of Town Clerks of Southern Africa*
- 1978 - 1979 *President, Commonwealth Associations of Town Clerks and Chief Executives*
- 1977 - 1984 *First Chairman, Association of Local Government Chief Administrative Officers*
- 1974 - 1984 *First Chairman, Bills Committee, United Municipal Executive of South Africa*
- 1984 *Presented with the United Municipal Executive's Charter for exceptional service to local government*
- 1985 *Elected Honorary Life Member: Institute of Town Clerks*

You will agree with me that this is a most illustrious career, a lifetime of service to the community, and many years of guiding the AMEU through the legal pitfalls of the electricity supply industry.

Dit was my voorreg om vir baie jare onder Mnr Burger te werk en hy was altyd gewillig om te help met enige probleem wat binne sy wye vaardigheid geval het.

Hier was 'n man, beskeie van geardeheid en alhoewel hy 'n pos beklee het wat baie eise op sy tyd geplaas het, was sy deure altyd oop vir amptenare wat hom wou raadpleeg.

Dit is dus vandag vir my 'n baie groot eer en voorreg om voor te stel dat die ereldmaatskap van die VMEO aan Mnr Alewyn Petrus Burger toegeken word.

#### MR A P BURGER

Mr President, honorary guests, Ladies and Gentlemen, I would like to thank the AMEU with which I have been associated so long for this very single honour bestowed on me. It is a particular honour to me because of the value of this association. I have been long enough in the municipal field, long enough in the arena, to know how valuable this Association is and furthermore to appreciate the value of the electrical engineering profession as far as the development of local government in South Africa is concerned. They have made a tremendous contribution to this Association's fate and to me it is therefore even a higher honour than any of you would realise to have had this membership conferred on me here today.

Ek wil mnr Barnard van harte bedank vir die mooi woorde wat hy gese het van my en die voorstel wat hy gemaak het. Ek het natuurlik op die toneel gekom, amper toevallig toe ek daar in Springs was toe kom die stad se Elektrotegniese Stadsingenieur daaraan. Mnr Downing het daardie dae altyd vir my baie ingewikkelde probleme gegee, toe dog ek by myself, maar dit lyk my nie ek weet vreeslik baie van hierdie besigheid nie, ek moet begin om iets daaromtrent te doen en toe besluit ek, ek gaan nou regtig dieper daarop in gaan en ek bespreek dit met 'n ou vriend, wyle Professor Myburgh. Hy se vir my, "man neem mee vir jou akademiese mens kry. Hulle sal vir jou leiding gee in die saak." Professore Joubert en Louw van UNISA. Die mens het vir my geweldig leiding gegee om nou werklik sistematies op die hele ding in te gaan, en dit is hoe ek in die saak betrokke geraak het. Hier het ek 'n afskrif van die eerste referaat van hierdie organisasie wat ek gelewer het. Dit was uitermate interessant om te sien hoe dinge verwikkel het en om vandag weereens by u teenwoordig te kan wees.

Mr President I would also like to use this opportunity to congratulate you and to wish you great success in your office. May I wish the Association of Municipal Electricity Undertakings a very great future which it deserves. It stood right in the midst of the greatest period of progress in local government and I am sure that we will have similar periods again in the future where it will contribute.

Thank you sir. Thank you again for the honour bestowed on me.

#### MR J K VON AHLFTEN: HONORARY MEMBER

#### MR D H FRASER

Mr. President, honoured guests, ladies and gentlemen, I had the privilege of nominating Denis Fraser as President-elect at the 1979 Convention in Rooodepoort and consider it a real pleasure once again being called upon to propose at this Convention in Cape Town that honorary membership be awarded to Denis Fraser, the City Electrical Engineer of Durban.

Honorary membership is not awarded lightly as the following record will show. Since the inception of the AMEU in 1915, 63 honorary memberships have been awarded over a period of 72 years which included such illustrious gentlemen as the late Dr. Hendrik van der Bijl, who in his time was both Chairman of ESCOM and ISCOR, Dr. Reinhard Straszacker former Professor in Electrical Engineering at the University of Stellenbosch

and also a past Chairman of ESCOM, 7 distinguished Councillors, 2 Chief Inspectors of Factories, 2 Directors of NEERI, a former Assistant Chief Director of the SABS, 5 Affiliates, 2 past Secretaries, 8 distinguished City and Town Electrical Engineers and 34 past Presidents.

Denis Fraser will now also join 3 former City Electrical Engineers and past Presidents from Durban as honorary members namely the late J. Robberts and C. Kinsman and R.M.O. Simpson, which goes to show in which high esteem Denis is being held by his colleagues on the Executive Council and all engineer members of this Association.

Denis Harvey Fraser was born on the 25th February 1926 in Durban and received his school education at the Durban High School and Durban Technical High School. He attended the Natal University from 1944 to 1948, interrupted in 1945 for service with the S.A. Airforce and obtained the B.Sc. degree in electrical engineering in 1948 and is a registered Professional Engineer.

His career with the Durban Corporation Electricity Department spans over a period of more than 38 years, first as Pupil Engineer from 1949, Distribution Engineer from 1962, Deputy City Electrical Engineer from 1965 and now the City Electrical Engineer from 1971 the year in which he was also elected to the Executive Council during my term of office as President. In 1981 he became the fifth City Electrical Engineer from Durban to be elected President of the AMEU.

His other interests and involvements includes Past Chairman, SAIEE Natal Centre, member of Council, Durban Technical College, Past President, Natal Institute of Engineers, member of various SABS Committees relating to electrical engineering and member of the Durban Country Club.

Mr. President, Ken Robson from East London in seconding the proposal in 1979 that Denis be elected President-elect referred to Denis as one of the "rarest gems" which has now been more than amplified by his outstanding record and achievements in the field of municipal electrical engineering over a period of nearly 40 years.

If there is one person who fits the qualification for honorary membership namely "a person who has distinguished himself and whom the Association desires to honour for outstanding services" then this person is Denis Harvey Fraser. The only sad note today is that his dear wife, Val, is no longer with us to share this honour with him of which she would have been justly proud.

Mr. President, ladies and gentlemen, as this is also my last Convention before retirement it therefore gives me great pleasure to formally propose that honorary membership of the AMEU be awarded to Denis Harvey Fraser, the City Electrical Engineer of Durban.

I thank you.

#### MR D H FRASER

Mr President, distinguished guests, ladies and gentlemen, it is an honour today, not only for me but also for Durban now to follow in the footsteps of three previous City Electrical Engineers who were similarly honoured viz— John Robberts, Clarence Kinsman and Ronald Simpson.

Thanks to proposer Jules von Ahlfen. I appreciate complimentary remarks and I value the friendship.

AMEU meetings blend Councillors, Affiliates, Engineering Services and further the position of the Executive Services to our cities and towns.

It is a great privilege to have been associated with this Association over many years. To get to know and become close friends with many of its members. Because of this I regard this as a very special day in my life, one which I shall always remember with gratitude and humility. My only regret is that my late wife, Val, is not here to share in the honour. The AMEU had a very special place in her heart because of the people she came to know during Conventions and Technical Meetings.

Mr President and Members of the AMEU, thank you for admitting me to the ranks of (illustrious) honorary members. You have shown me a great honour.

#### MR K G ROBSON: HONORARY MEMBER

#### MR J D DAWSON

Mr President, distinguished guests, ladies and gentlemen, it has been my particular privilege to have been a friend and colleague of John Dawson throughout the long years of our association as fellow municipal engineers in the Eastern Cape and as members of the AMEU - I have valued his friendship and his wise counsel - they have enriched my life.

John was born in Port Elizabeth in 1925 of Scottish parents, who had emigrated to South Africa. After matriculation at Marist Brothers College in Port Elizabeth in 1942 he studied at the Port Elizabeth Technical College where he had an outstanding academic record -

First in South Africa in different subjects on no less than six occasions; Obtained the National Engineering Diploma; Passed the examination of the Institution of Electrical Engineers (London); Awarded the gold medal of the Eastern Province Society of Engineers and the Silver Medal of the Port Elizabeth City Council as the best student in the Department of Technology.

John was articled in 1943 as a Pupil Electrical Engineer to the City Electrical Engineer of Port Elizabeth, after which he was appointed Engineering Assistant in the Uitenhage Electricity Undertaking.

In 1951 he moved to Graaff Reinet as Town Electrical Engineer but, after a short time, returned to Uitenhage as Assistant Town Electrical Engineer.

He was promoted to the Position of Town Electrical Engineer in 1955, a position to which in thirty-two unbroken years he has brought his own distinctive lustre. During this period he has seen the maximum demand of his town increase from 5 MV.A to 75 MV.A.

He is indeed a respected son of the Eastern Cape and we, his friends and colleagues in the AMEU together with the Town Council of Uitenhage which he has served for so long with singular dedication and faithfulness, salute him.

John Dawson is a Registered Professional Engineer, a Certificated Electrical Engineer, a Corporate Member of the Institution of Electrical Engineers (London) and a Fellow of the South African Institute of Electrical Engineers. He received national recognition in 1985 by being elected Honorary Vice-President of this Institute for the year 1985/1986.

Referring to his AMEU involvement and commitment, he attended his first AMEU Convention in Pretoria in 1955 and, with the exception of two Technical Meetings, has been his Council's delegate at all Conventions and Technical Meetings for the past thirty-two year period.

He was a founder member in 1957 of the Cape Eastern Branch of the AMEU, was Chairman on three occasions and for thirty years has been a major influence in shaping and developing the unique character of this branch. John Dawson has established a remarkable and proud record.

Elected to the Executive Council of the AMEU, it has been in this position of leadership that, in various capacities, he has demonstrated his high sense of duty, energy and talents. He served for a number of years as an influential member of the NBRI Steering Committee on Guidelines for the Provision of Engineering Services for Residential Townships and as Convener of the AMEU Technical Training Committee, in which position he has provided sterling and innovative guidance.

Our friend John is a man of diverse qualities and interests. He is a wild life photographer and philatelist of repute. His community service since 1966 as a member of Rotary has been exceptional and he and his attractive wife June have each been honoured with the international Rotary accolade of Paul Harris Fellow.

He has many fine personal qualities – his staying power is one such quality (as an aside – I am sure you will have observed this remarkable attribute at many, many late night convivial social functions and parties!). However, the quality I have come to admire in him is his constancy, which the Oxford Dictionary defines as “steadfastness of attachment to a cause.” He is impeccable and efficient in the tasks he undertakes and sets for himself high standards of integrity and conduct.

His involvement in the work and contribution to the achievements of the AMEU are visible outworkings and expressions of his convictions and professional competence.

The “central belief” of Jean Monnet, that remarkable personality of France’s post-war politics and of whom it was said that he was “chief among the fathers of Community Europe”, is apposite in considering John Dawson’s impressive service to the AMEU and the opportunities the AMEU as an institution presents to its membership:

“Nothing is possible without men;  
nothing is lasting without institutions”.

Mr President, ladies and gentlemen, we are privileged as an assembly of distinguished guests, friends, colleagues and associates to do him honour this day.

Accordingly, it is with a sense of pleasure and honour that I propose formally that Honorary Membership of the Association of Municipal Electricity Undertakings of South Africa be conferred on Mr John Douglas Dawson Pr. Eng.

#### MR J D DAWSON

Because of its inherent diversity the Association of Municipal Electricity Undertakings means many different things to different people. To me it means the opportunity to associate with my fellow municipal electrical engineers and their councillors

and many other people from all over South Africa. In many cases these associations have developed into enduring friendships which I value very much.

This membership has also given me the opportunity to participate if only in a small way in the affairs of the electricity supply industry at national and provincial level.

To be made an honorary member of such an organisation is a great honour and my sincere thanks go to the Executive for nominating me to this Convention.

Past-President Ken Robson has today said many kind things about me but has restricted his comments to what might be described as successes. Let me assure you that there were also many failures and disappointments of which I am only too well aware.

However on an occasion like this I gather one is allowed to relax and accept the kindnesses and praise and I am most grateful to Ken.

I was particularly pleased when I was told that Ken would be formally proposing my honorary membership because we have been friends and associates for many years.

My only sadness is that this will probably be one of the last of his official duties in the AMEU as he will be retiring from municipal service in the very near future. I am sure that I echo the sentiments of many present when I say that he will be greatly missed at all levels in the AMEU.

Mr. Fortmann may I take this opportunity of congratulating you on becoming President together with my best wishes for your term of office. I assure you of every support within my capabilities.

Mr. President, members of the AMEU, thank you very much.

#### UITNODIGING 1988 TEGNIESE VERGADERING

##### RDL CHRIS LANDSBERG: POTCHEFSTROOM

Mnr die President, namens Potchefstroom noui ons graag die VMEO uit om in die 150e bestaansjaar 1988, hul Tegniese Vergadering te kom hou. Potchefstroom sal baie graag as gasheer vir u wil optree.

##### MR A FORTMANN: PRESIDENT

Baie dankie Raadslid Landsberg vir u vriendelike uitnodiging. Die VMEO aanvaar dit met dank.

##### 51ste KONVENSIË: UITNODIGING

##### RDL E FICHARDT: BLOEMFONTEIN

Mnr die President ons is vanoggend as Vrystaters baie, baie trots op Dr Nico Botha, wat die besondere prestasie bereik het om deur soveel lede van hierdie Vereniging gekies te word tot die Aangewese President van die VMEO. Daarom wil ons as Stadsraad van Bloemfontein vir u namens die Burgemeester van Bloemfontein, namens die stadsraadslede en al die Bloemfonteiners, vir u baie, baie hartlik uitnooi om u Konvensie oor twee jaar in Bloemfontein te hou. Ons kan hom verseker, vir u almal verseker, dat u verbylf in Bloemfontein vir daardie paar dae werklik 'n groot aangenamheid sal wees.

##### MNR A FORTMANN: PRESIDENT

Baie dankie Raadslid Fichardt vir Bloemfontein se vriendelike uitnodiging om die volgende Konvensie in 1989 te Bloemfontein te hou. Die VMEO aanvaar u uitnodiging met dank.

#### GREETINGS – GROETE

##### MR DENNIS KNEALE

On behalf of the Electrical Contractors' Association of South Africa I wish to extend to you our congratulations on your election as President of this marvellous organisation. I believe that you are going to fill the position very well indeed from the association that you and I have had in the past. I'd like to congratulate Dr Botha on his election as the President Elect and I'd like to wish the AMEU a very, very successful conference.

Thank you sir.

##### MR WESSEL BARNARD

Mr President, the Chairman and members of the Electricity Control Board have asked me to convey their congratulations to you and to wish you and the Association a very successful convention.

##### MISS I BROWN, POWER ENGINEERS

On behalf of Power Engineers I wish to congratulate Mr Fortmann on his election as President of the AMEU. I am sure he will cope admirably with all the tasks he will face during the two years of his office.

To all the delegates I wish to say – welcome to Cape Town and I hope you enjoy the luncheon.

## EXECUTIVE COUNCIL 1987/89 UITVOERENDE RAAD



### SEATED/SITTENDE L/R:

*Messrs. Ken Robson, Jules van Ahlfen, Jan Loubser, Alwin Fortmann (President), Dr. Nico Botha (President Elect/Aangewese-President), Denis Fraser, Bennie van der Walt (Secretary/Sekretaris), Gordon Davies.*

### STANDING FIRST ROW/STAANDE EERSTE RY L/R:

*Christo Peyper (Rdl), Ben Steyn (Rdl), Ralph Classen (Rdl), Piet Botes, David Briers, Frank van der Velde (Clr), Charles Adams, Ken Murphy.*

### STANDING SECOND ROW/STAANDE TWEDE RY L/R:

*Ryno Kriel (Rdl), Max Clarke, Attie van den Berg, Gene Heydenrych, Fred Daniel, Guys Müller (Rdl).*

## HUMAN RELATIONS IN TERMS OF PRESENT MANPOWER LEGISLATION

by Mr Johan van der Merwe

Mnr die President, in die eerste plek wil ek graag my gelukwense oordra aan u met u verkiesing, en inhuulding as President van hierdie baie belangrike organisasie. Dit is altyd aangenaam om teenwoordig te wees wanneer 'n persoon wat dit verdien die hoogste sport in sy of haar beroepsveld bereik. Soos u gesê het, ken ons mekaar vir baie jare en is ek dan saam met u dankbaar vir genade en vir talente. Ook aan u voorganger, mnr Jan Loubser, wil ek my waardering betuig oor die rol wat hy gespeel het om die belange van die VMEQ op so veel vlakke te dien. Hy en ek het mekaar op talle tegniese en werkskomitees ontmoet en ek was deurgaans beïndruk met sy bydraes in belang van plaaslike regering. Baie dankie, mnr Loubser, dat ek ook met u kon geassosieer gewees het en ook aan dr Botha en die res van die Raad wat nou net gekies is, sê ons baie geluk. Ons vertrou dat u sal groot vreugde vind uit waarmee 'n besig is. U organisasie mnr die President speel 'n lewensbelangrike rol in die werking van plaaslike regering en ek kry lankal die gevoel dat u nie altyd die erkenning kry wat u toekom nie. Met hierdie rede is dit vir my 'n besondere voorreg om vandag 'n aantal gedagtes met u te kan wissel. Ek moet herken mnr die President dat ek altyd minderwaardig in die teenwoordigheid van die ingenieursgemeenskap is. Die rede daarvoor is baie maklik en dit is omdat hulle om my vrae enige antwoord kan gee en ek sal nie eers weet of die antwoord reg of verkeerd is nie. Dit is wat my frustrer maar ek sal vandag probeer om u in dieselfde posisie te plaas, maar ek het so 'n gevoel dat ek ook hier tweede sal kom. Dit is vir my interessant om so deur die lys vandag te kyk na al die ingenieurs by plaaslike bestuure en dit het my opgeval dat onder die drie Van der Merwes is 'n enkele ingenieur nie en toe het ek vir die eerste keer regtig besef 'n mens het verstand nodig om 'n ingenieur te word. Ek vertel graag die storie van hierdie raadslid Van der Merwes, hulle neuk altyd orals in maar hierdie spesifieke een was 'n ingenieur by Durban se Stadraad en die agbare raadslid Van der Merwe se Engels was nie baie "bright" nie en toe - die Durban Corporation decided that they were going to upgrade the beachfront. In the process of upgrading the beachfront they decided that they were going to build a number of new urinals on the beachfront. So the consultants said:

"Councillor, how do you feel about building a number of new urinals. He replied: "Nee, dis alright, what about a few arsenals as well?"

Now Mr President, the subject of labour relations is constantly in the news these days and we are all aware of the impact it's made on the South African employment scene. I don't have to remind you of the recent strike staged by the National Union of Mineworkers while most of you must have been confronted by labour unrest in some form or other in the past year or so. If we look back over the years it is obvious that we have had our share of labour unrest throughout the year. The best example being the infamous mine strike of the earlier part of the century. This strike was squashed by the South African Police and the South African Defence Force on instructions of the Central Government at the time. In those days only whites had the right to belong to recognised trade unions and the Government kept a very tight rein over labour activities with the result that the employer section sat back without involving themselves, knowing full well that the Government will always act in case of need. The handling of the mine strike was an excellent example of labour policy at that stage of the century. Met ander woorde dit het daarop neergekom dat ons het 'n vakbondstelsel gehad met die regering aan die eenkant, die werkgever aan die ander kant van die driehoek en die werknemer aan die ander kant van die driehoek in daardie tyd. Die regering het die dominante rol gespeel met hierdie verhouding tussen werkgever en werknemer en die Staat in die totaliteit van werkgevers en werknemers. Today the scene has changed dramatically after the acceptance of the



Mnr Johann van der Merwe, voorsitter van die Munisipale Werkgeversorganisasie.

Wiehahn Report. It is now official government policy to leave labour issues to be negotiated and resolved between the employer and the employee. They are now the main actors in the local labour scene and I think that if you think back about the very recent mine strike of the National Union of Mine Workers you will recall that there was absolutely no government interference whatsoever which indicates to you quite clearly that the Government will not involve themselves in this sort of situation. I think that you could even find cases where illegal strikes came about in various local authorities where strikes are in fact illegal and where the police simply will not involve themselves lest there is some illegal action taking place for instance, murder or intimidation or theft or anything like that but they will not involve themselves in the strike reaction as such. Government policy now is not to involve themselves in this matter any longer as they put it, they no longer have the intention of becoming part of the problem. It is now official government policy to rather provide mechanisms in which the employer and the employee can negotiate or resolve its own disputes. These mechanisms include actions such as arbitration with the conciliation boards, the industrial councils and even the industrial court. Another important change is that non-whites can now also associate freely by joining the union of its choice. There is no doubt that these unions are making their presence felt in local government undertaking these days. We can place these unions in basically two categories. On the one hand, the bona fide responsible unions whose main aims is to serve the legitimate rights of their members. I think SAAME is a very good example of that, being a union that will fight for the rights of its members despite the fact that they will always act within the framework of the law, this making them a very responsible union. On the other hand, those unions whose aim it is to use the workplace as a place for political confrontation. Ek dink ons moet aanvaar, mnr die President, as ons so deur die Toop van jare kyk, dat vakunies 'n baie belangrike rol kan speel om selfs land se regerings tot 'n val te bring. U het gesien wat in Britanje by geleentheid gebeur het. Hulle kan die hele ekonomie van die land ruïner as hulle wil, as hulle werklik daardie dag besluit om saam te staan en hulle kan selfs regerings tot 'n val bring. En vir die rede is dit nie vreemd dat die swartgemeenskap in 'n groot mate daaraan dink om hulle politieke regte wat hulle waarskynlik voel hulle nie het nie en verkry deur middel van vakbondaksie.

All in all Mr President we must accept that the South African labour scene is no longer the place where the employer can hide behind the Government's skirts, he must now equip himself to



deal expertly with trade unions, his financial and legal muscle is without doubt, formidable.

Wanneer enige funksionaris na die mannekrag prentjie van die plaaslike owerheid kyk, dan val dit jou op dat die afdelings van die ingenieurs waarskynlik die meeste personeel van alle rasse in diens het. Vir hierdie rede is dit dan ook hierdie afdelings waar die potensial vir arbeidsskok die grootste bly. U lees en hoor dag na dag berigte aangaande stakings, die vorming van nuwe vakbondgroeperings, intimidasie en vele ander sake wat met arbeidsverhoudinge eintlik gepaard gaan. Omdat u, in u beroep selde of ooit gekonfronteer word met vrae en antwoorde oor 'n onderwerp soos hierdie, waarmee die ingenieur homself nie van dag tot dag besig hou nie, is ek eintlik dankbaar vir hierdie geleentheid wat die VMEO aan my bied om 'n dag baie opeervlaklik met u oor arbeidsverhoudinge te besin. U sal opmerk dat ek baie skielik die term "menseverhouding" met "arbeidsverhouding" vervang. Die rede daarvoor is omdat arbeidsverhouding niks anders as menseverhouding op die werksvloer is nie. Indien mense nie in een of ander verhouding tot mekaar op die werksvloer staan, sou die begrip arbeidsverhouding nie nodig gewees het nie en indien daar nie vakbonde gewees het nie sou geen organisasie nodig gewees het om 'n balans aan hierdie stelsel van arbeidsverhoudinge in die land te verleen nie. Nou meeste van ons is geneig om arbeidsverhoudinge te assosieer met groot konfrontasies tussen werkgewers en werknemers. Iets wat die werkgewer in konfrontasie bring met die vakbond en omgekeer.

Voor ons besef het die basiese eenvoudige konflik op die werksvloer verander in 'n reusagtige en 'n letlike konfrontasie tussen werkgewers en die vakbond. Daardie een insident van swak menseverhoudinge kan voor jy weet omskep word in 'n konflik of staking van nasionale omvang. Vir hierdie rede is dit belangrik dat u en ek en elkeen van u toesighoudende personeel moet weet hoe om op die werksvlak op te tree sodat hierdie soort van konflik verhoed kan word. Een enkele onbesonne optrede van 'n laevlak toesighouer, kan 'n werkgewer uiteindelik der duisende rande kos aan verlies van produksie, hulpkoste en bowenal, geloofwaardigheid. Die werkgewersorganisasie bied aan sy lede 'n reeks kursusse in konflikbestuur aan, ten einde die werkgewers, dit wil sê in die Raad, voor te berei vir alle moontlikhede. Kursusmetodes van laevlak toesighouers is ook al reeds beskikbaar gestel en ons glo werklikwaar dit is die moeite werd om hierdie kursusse te ontwikkel. Ons mense, dit wil sê, die toesighouers sal net eenvoudig moet begryp dat ons nie maar net kan "hire or fire" soos dit vroeger aan die orde van die dag was. Die werkers, en ek praat van alle rasse, het nou seker basiese regte wat deur die Wet en derhalwe ook ons howe beskerm word.

Ons in die plaaslike regering is relatief gelukkig dat ons as gevolg van ons mensekennis, groot sukses tot nou toe behaal het, maar glo vir my, mnr die President, ons leef al hoe meer op geleende tyd. Ons moet daardie tyd gebruik om ons menseverhoudinge en ons arbeidsverhoudinge op te knap en te vergee van die feit dat ek die swart man ken omdat ek saam met hom groot geword het. Dit is 'n illusie wat u gou sal verloor na mate ons aangaan. Wat ek hier sê hou verband met die regte van alle werkers, wit, swart en bruin, omdat die opkoms van al die militante vakbonde die werker se benadering verander het. U sal vind dat in baie gevalle dat die man wat by die vakbond skielik 'n rol speel nie noodwendig daardie voorman wat jy het, of nie noodwendig daardie leierhand wat jy het is nie, jy gaan agterkom dis dalk die tejong wat besig om u teemener af te bedien as gevolg van sy eie status binne die swartgemeenskap waarin hy lewe. Dit hang nie van sy werk af nie en wanneer hy by die vakbond betrokke raak dan gaan jy skielik vind dat hierdie man se hele houding verander. Hy begin skielik 'n gevoel van belangrikheid kry. Hy begin skielik 'n gevoel kry van "ek beteken iets, en ek kan konfronteer en ek kan my saak stel en die mense kan my nie meer onder my 'jack' net skop" en dan vind jy skielik dat jy met 'n totaal ander persoon besig is.

Firstly Mr President we must accept that all workers have equal rights in terms of existing Manpower legislation. Ons kan nie langer diskrimineer nie. U stelsels moet so ingerig wees dat daardie stelsels nie diskriminerend van aard is. As u byvoor-

beeld posevalueringstelsels tref dan moet daardie stelsels van so 'n aard wees dat u absoluut seker is dat die stelsel voorsiening maak vir gelyke regte van alle kwalifikasies en alle ondervinding en alle tipe van dinge.

Now black and brown workers can therefore demand equal treatment in terms of employment, remuneration, leave and general employment. It is our experience that they tend to exercise these rights more and more as time goes by. It is vital to understand that the dismissal of an employee, this is important, is no longer a simple matter and he can no longer be dismissed at law since the introduction of the so-called Unfair Labour's Practice Definition into our legislation. Our legislation as well as the establishment of the industrial courts, the rights of our workers are now firmly entrenched. Now if I use the rights of our workers I must make it quite clear that it is not only the worker who has rights in terms of legislation, the employer also has rights and it is a matter of understanding and recognising these rights and knowing how to utilise these rights in a confrontation with the trade unions. The employer is therefore suddenly confronted by a new concept that has to be adhered to. This concept is that of the unfair labour practices and it is important for the employer to know exactly what is meant by unfair labour practices as far as the rights of both parties are concerned. En nou moet jy 'n bietjie luister na hierdie dinge en dit is die definisie wat ek net vir u so uit die Wet uit gaan lees. En as ek die definisie vir u lees dan moet jy besef tot watter mate moet 'n mens deesdae aandag gee aan die regte van jou mense want jy kan nie sommer 'n man se regte aanraak nie en verander na willens en wetens. Die Wet sê, "It is any labour practice, or any change in labour practice which has, or may have the effect that any employee or class of employee. . . . Met ander woorde hy omvat nie net meer die enkeling nie, hy bevat ook die groep. . . . may be unfairly affected or that his or their employment opportunities, work security or physical, economical, moral or social welfare is or may be prejudiced or jeopardised by such action." Kan u begryp as ek vir u sê dit laat omtrent geen reg van daardie man wat nie meer aangeraak word sonder dat u as werkgewer werklikwaar daaraan aandag moet gee om seker te maak dat hierdie soort van regte nie sommer oor gehardloop word. As a result of this concept, the whole issue of dismissal has given rise to a number of unfair labour practice cases in our industrial court. The industrial court has taken the view that a dismissal must not only be lawful but it must also be fair and reasonable under the circumstances and this fairness falls into two categories, that is procedural fairness and substantive fairness. Nou sê die Wet vir u jy kan nie maar net sommer 'n man ontslaan nie omdat hy 'n oortreding begaan het. Hy sê nou vir jou, jou procedure om hierdie man te ontslaan is van net sulke groot kardinale belang en as jy nie die korrekte procedure volg dan het jy ernstige probleme. Die Wet sê verder "As far as procedural fairness goes the industrial court tends to rely on guidelines by the Industrial Labour Organisation." So ons moet ons self nie bluf nie om maar te sê die Internasionale Arbeidsorganisasie is daar ver weg in Genève, nee, baie van hulle reëls, hulle regulasies word net so hier in Suid-Afrika toegepas. A dismissal will usually be regarded as a procedural affair. If a proper inquiry has been held at which the employee had suitable representation, at this inquiry the employee should be given full access to the facts which aroused the incident, he should be able to ask questions, state his case and furthermore he should, if he wishes, be represented by his shop steward or a fellow employee and lastly, reasons should be given for his dismissal.

Met ander woorde, wat ek probeer vir u sê, is dit: As u 'n werknemer deesdae ontslaan sonder om 'n behoorlike ondersoek te hou, waar hy verteenwoordig kan word deur 'n kollega of een van sy werkerrandslede of een van sy 'shop stewards', as u nie 'n behoorlike rekord hou nie, as u nie hom 'n geleentheid gee dat daar van hom getuig kan word nie, as jy nie geleentheid gee om sy saak te stel, en al daardie tipe van dinge, amper soos 'n gewone landdroshof, dan wil ek vir u sê dan is u besig, wat procedure betref net 'n onbillike arbeidspraktyk. Daarom is dit baie belangrik dat u sal verstaan dat as mense partykeer sommer net 'n man ontslaan dan vind 'n mens outomaties die geval dat hierdie man draai om en hy beroep hom op die nywerheids hulp waar die sogenaamde status quo bevel in terme van Artikel 43

van toepassing is. Het jy al gehoor daarvan? Dit beteken eenvoudig dat hy na die hof toe gaan en vir die hof sê. "Ek is as gevolg van die verkeerde prosedures van my werkgewer ontslaan en ek vra asseblief om herindiens gestel te word. Dit is ook 'n nuwe konsep wat nou in die Wet inkom, hierdie kwessie van herindienstelling en as die hof dan so 'n herindienste se status quo bevel sou uitreik, dan moet hy weer herindiens genaam word asof hy nooit ontslaan was nie. Dit beteken outomaties dat indien so 'n bevel teen 'n werkgewer uitgereik sou word, dan moet hy baie duidelik beseft dat die gevolge daarvan verder buitekant die bevel self gaan om die terugname van hierdie man, want dit is dan 'n grootskaalse oorwinning vir die vakbonde teen oor die werkgewer en ek wil vir u sê as 'n vakbond so 'n bevel teen 'n werkgewer gekry het, dan neem sy lidmaatskap sommer outomaties van 50% na 100% toe, want hy het skielik sy 'muscle' gewys. Hy het gewys hy het krag en daarom wil ek by u pleit, mnr die President, dat wanneer daar gekry word na procedure dat hulle baie seker is dat hierdie prosedure absoluut aan die vereistes van procedure en regverdigheid beantwoord. Dan wil ek ook by u pleit dat waar u sulke verhoor hou moet u asseblief tog behoorlike rekords hou daaraan. U moet behoorlike rekords hou van wat gebeur tydens die vergadering en al die tipe van dinge. Dit is belangrik dat u ook behoorlike rekords sal hou van die werkskiedenis van die personeel. As dit dan sou gebeur, dat u personeel wat vir u goeie werk lewer, 'n aantekening maak in sy lêer dat die man daarvan 'n aanpnynging gekry het maar sou die man swak werk lewer en hy word gewaarsku, na 'n verhoor en die waarskuwing is aangeteken in die lêer, dan moet u presies weet dat daardie soort van rekord belangrik gaan wees as daar miskien 'n tweede of 'n derde keer verhoor word en jy dan wil bewys dat hierdie man aan 'n wetlike oortreding skuldig is. In terme van die huidige wetgewing beteken 'n finale waarskuwing niks nie, al is hy 'n finale maal gewaarsku en hy daarna nog oortredings sou pleeg moet jy hom weer verhoor, jy moet hom weer aanhou, jy moet weer deur die volle prosedures gaan en dan kan jy die vorige waarskuwings gee maar ook net as verswaarde omstandighede gebruik.

As far as substantive fairness goes, termination of employment should only take place on grounds relating to the capacity of conduct of the employee in terms of the operational requirements of the undertaking. Wat ek vir u sê is dit: as die elektrotegniese ingenieur by die burgemeester se vrou gekuier het beteken dit nie u kan hom ontslaan nie, u kan hom net ontslaan as hy by die stadsklerk se vrou hom kuier. Al wat ons vir u sê is in terme van huidige wetgewing kan u alleenlik 'n persoon ontslaan vir 'n oortreding wat verband hou met sy werk. As hy 'n oortreding begaan het buite sy werk, hy het 'n verkeerskaartjie gekry of hy word skuldig bevind aan een of ander oortreding wat met sy werk niks uit te waai het nie, dan kan u nie meer sê ek gaan nou van hom ontslae raak nie. Ek het nou die dag 'n tipiese geval gekry. Hier was 'n jollie-patrolle gewees met 'n paar van die brandweermanne. Hulle het by 'n paar skoolmeisies gekuier gedurende skoolure. Die meisie het vir die brandweer gebel en gesê dit is haar verjaarsdag, haar ma het gesê sy kan haar present kry deur vandag by die huis te bly en sy kan die brandweermanne bel om te kom kuier. Hulle het gaan kuier en nou bel die skoolhoof en hy's baie kwaad, hy sê ons moet die brandweerman ontslaan. Nummer een, die brandweerman was nie op diens, hy het buite sy werkstyd gaan kuier en aan daardie patrollie gaan deelneem, so met die gevolg, ek kan in terme van arbeidswetgewing, geen aksie teen daardie mees neem in so 'n geval nie. Ek dink ons moet dit net baie goed verstaan. Now in other words this conduct, which relates to his capacity of conduct, can be manifested in a single dramatic incident such as theft within the organisation, assault on an employer or can be established through the repeated unacceptable behaviour such as persistent late coming, persistent negligence, frequent absenteeism, to mention just a few. If any employee feels a grief by dismissal, he can approach the industrial court for relief, usually through his trade union. Applications can then be made for a status quo order which will, if granted, re-instate the employee to his former benefit, depending the outcome of the final unfair labour practice determination. These hearings, Mr President, it is the employer and listen to this, who must prove that the dismissal was fair on the merits of probabilities. Daarom sê ek weer vir u rekordhouding, mnr die President, van personeel ek

aktiwiteite en van die dinge wat met hulle gebeur het, is van kardinale belang. Daardie persoonlike lêer wat 'n man se skiedenis vir jou aangee. It is therefore clear that the path of dismissal is filled with danger. For this reason dismissal procedure in the undertaking of becoming increasingly important. A well constructed dismissal procedure will contain the essential points of substantive and procedural fairness. Enige prosedures wat ingestel word moet bekend wees aan alle werkers van die mees senior af tot by die mees junior amptenaar, ongeag van sy ras of kleur. As hulle nie behoorlik ingelig is nie dan wil ek vir u sê dat ons nie net baie onregverdig is maar ek dink ons is ook baie onverskillig. Mnr die President, ek het gepoeg om saam met u te krap aan die oppervlakte van 'n baie komplekse studie. Na mate ons in ons pogings vorder om eenvoudige diensvoorwaardes in die stelsels van ongelukkigbestuur saamgestel te kry of af te kondig, sal ons talle van hierdie probleme ondervang. Alles begin en eindig egter by gesonde menseverhouding. Wanneer alle werkers dieselfde regverdige optrede ontvang en soos mense behandel word, sal ons minder konflik op hierdie vlak genereer wat later kan oorspoel tot op 'n nasionale of internasionale ramp. Ek kan nie genoeg beklemtoon dat die meeste konflik op die lae vlak ontstaan. Vir hierdie rede is dit vir u, ons hoofde van groot afdelings absoluut noodsaaklik om u siening menseverhouding op hierdie vlak te verbeter ten einde die ontstaan van latere katastrofes te voorkom. Mnr die President, ek volstaan deur te sê ons is almal mense met rege, vermoëns, gevoelens, gesinprobleme, frustrasies en hoop. Ons kan deur gesonde menseverhouding 'n nuwe Suid-Afrika skep of werkslaam sonder om te stry. Niemand hou van kruipers nie maar almal van ons waardeer vriendskap wat gebou word op wedersydse goeie menseverhouding. Baie dankie.

#### MNR C A ANDERSON: ADJUNK-STADSKLERK, PRETORIA

Mnr die President, mnr Van der Merwe het daarin geslaag om sonder groot omhaal van woorde die belangrikheid van goeie arbeidsverhouding op die werksvloer vlak aan ons tuis te bring en ook ons aandag op belangrike toevoegings tot die Suid-Afrikaanse stelsel vir nywerheidsverhouding soos byvoorbeeld onbillike arbeidspraktyke te vestig. Daarvoor wil ek aan hom baie dankie sê.

Ongelukkig het die praktyk geleer dat konflik nie altyd deur middel van gesonde menseverhouding verhoed kan word nie. Deur slegs op goeie menseverhouding te konsentreer, kan tred verloor word met die realiteit van arbeidsverhouding in Suid-Afrika. Vanweë ons plurale gemeenskap, modernisering van die leefwyse, die stand van die ekonomiese, asook demografiese en ander faktore is konflik onafwendbaar (Van Jaarsveld, 1985). Die sleutel tot 'n suksesvolle arbeidsverhouding-stelsel by enige onderneming is die *vermindering* van konflikareas tot 'n minimum, die identifisering van gemeenskaplike doelwitte en die blywende konflik deur middel van kompromie elke keer wanneer dit voorkom. Die bestaan van gesonde menseverhouding sal die oplos van konflik deur middel van kompromie moontlik maak. Mnr Van der Merwe sal moontlik op hierdie perspektief wil reageer.

Mr President, I am pleased to hear that the employer's organisations are currently offering a series of courses in conflict management. An important duty of the Head of an Electricity Department is to see to it that the necessary knowledge is acquired and that suitable skills are developed by his supervisors to enable them to handle the increased complexity. Full use should be made of the supporting systems offered by the Personnel Department.

It should be borne in mind that man behaves in accordance with his image of reality. Incorrect perceptions can be modified by means of training sessions, resulting in improved human relationships. Training in labour relations should therefore be directed to all levels, including elected workshop representatives. Mister Van der Merwe's comments in this respect will be appreciated.

Thank you Mr President for the privilege of being invited to contribute to Mr Van der Merwe's keynote address.

## DR NICO BOTHA: BLOEMFONTEIN

Mr President, I would like to congratulate Mr van der Merwe on a very timely and interesting paper which I am sure will elicit much discussion. I think that this is a timely paper because it will once again focus our attention on the value of our personnel. Mr President, Glenn Stahl once said: "You can buy a man's time, you can buy a man's physical presence in a given place, you can even buy a measured number of skill per hour or per day, but you cannot buy enthusiasm. You cannot buy initiative. You cannot buy this loyalty. You have to earn those things." Quite smartly Mr van der Merwe has changed human relations to labour relations which I find quite acceptable for the purpose of this paper. Furthermore, I fully agree with him that we do not live any longer in a "hire and fire" time. On the other hand I am also convinced that most of our electrical engineers are well clued up with unfair labour practices. No one of us can, however, guarantee sound relations at all times therefore I agree that we should prepare ourselves for any possible labour unrest. Die referent het op 'n eiesoortige wyse die voordele van die MWO oorgepra. Ons is dankbaar om te kan verneem dat die Munisipale Werkgeversorganisasie die nodige kundigheid en ervaring reeds opgedoen het. Ons is ook dankbaar dat hulle hierdie kundigheid en ervaring tot die beskikking wil stel van andere.

Ek erken dat onderhandeling oor arbeidsverhoudinge of met vakbonde vandag nie net kennis verg nie, maar dit is "n kuns" "it is an art". Dit is "n kuns wat bemeester moet word. Meneer die President, ek glo en is van mening dat wanneer arbeidsomstandighede ontstaan, en dalk verskil ek en Mnr van der Merwe op hierdie punt, dat plaaslike mense, wat die eiesoortige plaaslike omstandighede beter behoort te ken, beter onderhandelaars behoort te wees op voorwaarde natuurlik dat die plaaslike onderhandelaars oor die nodige kundigheid en kennis beskik. Ek het ook al die argument gehoor dat die onderhandelaars van buite die organisasie waar die arbeidsomstandighede heers, meer geloofwaardig het as die plaaslike mense. Ek wil graag vra dat mnr van der Merwe hierop moet reageer.

In sommige kringe word ook die mening gehuldig dat 'n goeie kennis van kultuurverskille 'n belangrike rol kan speel. Ek wonder of mnr van der Merwe nie ook hierop wil reageer nie. Dan wil ek ook vra aan mnr van der Merwe of hy hom nie wil uitlaat oor die nuwe arbeidsverdeling wat al nou 'n hele paar jaar van krag is en ons wil graag hoor of daar betere betrekkinge aan die orde van die dag gestel het. Meneer die President ek wil se dat ek nie glo dat daar vandag nog munisipale elektriese ingenieurs is wat hulle sout werd is en wat dan nog steeds in hulle kokon van professionalisme toegespin is. Ek is oortuig dat die meeste van die elektrotegnieseingenieurs hulle ook self bekwaam het op die aspekte soos onder andere konflikbestuur en arbeidsverhouding. Indien enige elektreesingenieur sou reken dat arbeidsverhouding is noodsaaklik vir die taak van die Personeel Direkteur, dan is ek bevrees sy broek is besig om af te val. Aan die einde van die dag glo ek egter dat gesonde arbeidsverhouding moet daaglik aangewerk word met ander woorde, ek glo aan proaktiewe optrede. Miskien kan mnr van der Merwe ook hierop reageer.



Dr Nico Botha, Aangewese-President van die V.M.E.O., aan die woord.

## MNR J VAN DER MERWE

Toe ek hier so ingeloo kom in die saal sien ek hier's 'n hele paar manne wat besluit het, "ou maat, hierdie is die middag om te gaan golf speel." Dit laat my so hoeka dink aan die storie wat hulle vertel van die vrou wat so beindruk was met haar eie sangstem toe sy vir haar vriendin, "Sarie, het jy gehoor hoe vul my stem die saal?" Toe se Sarie: "Ja, en ek het gesien hoe loop die mense om plek te maak daarvoor."

Mnr die President, dr Botha het spesifiek gewys na die kwessie van onderhandelings-situasies, mense van binne van buite. Ek wil vir u se dat dit absoluut essensieel is dat die onderhandelingsgedoende moet deur die mense wat nou binne die organisasie is. Daar's geen twyfel op my gemoed daaroor, jy moet die beeld by jou eie werker hier skep dat jy binne jou eie organisasie nie oor die vermoede beskik, dis van essensieel belang. Die mense wat die onderhandelings doen moet behoortlik opgelei wees in die hele situasie van onderhandelingsgetegnik om vir u dit meer korrek te stel die metodiek van onderhandelings met die vakbonde is deurgaans so gespesialiseerd, hulle eie opleiding is van so aard dat jy beswaarlik 'n man wat hoegenaamd geen ervaring daarvan het in die veld te stuur.

Daarom moet ons aanvaar dat die opposisie aan die ander kant, die gaan van hoogstaande opgeleide gehalte mense en hulle vermoed om veral te onderhandel op so 'n manier dat hy vir u gaan kwaad maak, dat hy vir u boosaardig kwaad gaan maak en dat u dan gaan dinge se wat jy nie moet se nie of dinge doen wat jy nie moet doen nie of uitlatings maak wat u nie moet maak nie en dan onmiddellik kom hy terug na die situasie waar hy u kan beskuldig en se, "you're not negotiating in good faith". So, met ander woorde, ja, plaaslike onderhandelings baie beslis maar dan moet hulle opgelei wees. Maar nou moet 'n mens baie katvoet loop, jy kan nooit die plaaslike man soveel oplei dat hy die totale spektrum van al die regse slaggate wat daar kan wees en al die dinge kan hanteer. Daarom is ons uitgangspunt nog altyd gewees terwyl jy met die onderhandelingsproses besig is, sal jy vind dat die vakbond gedurig besig 'n om vir die vakbond onderhandelaar te bel en te praat met sy grootboet, by sy hoofman en daar om se 'n hou maar jou hoofkantoor en die ander kant in ons eie organisasie ook op die hoogte want hy kan jou partykeer net adviseer watter dinge jy moet doen om te vermy dat indien jy in 'n nywerheidsbelaand, dat jy dan aan die agterste speen gaan suig. Daarom is dit eintlik 'n spanpoging in sy totaliteit. U het my gevra om my uit te spreek oor die huidige arbeidsbedeling. Ek is bevrees dat ons in Suid-Afrika nie langer sou kon voortgaan op 'n stelsel waar daar nie vakbondrege aan die ander rasse gegee kon word want ek wil vir u se dit kon die grootste kruitvat gewees het wat ons nog mee te doen gehad het op die lang termyn.

Ek is 'n groot gelowige in die stelsel van onderhandelings en my onderverinding tot nog toe is dat ons omtrent enige situasie met selfs die moeilikste militante vakbond deur middel van onderhandelings kon ontloot. Nou wil ek vir u se dat dit baie interessant is dat 'n mens baie maklik in 'n situasie kan beland waar jy net kan se verbied, verbied die wet, ons jaag die polisie en die tipe van ding. Ek is bevrees dit is nie meer die manier hoe ons die dinge kan hanteer. Op 'n vergadering van die Internasionale Arbeidsorganisasie wat nou net afgeloop het in Genève, in Switserland is dit baie duidelik gestel dat daar nou 'n konsentreerde aanslag gaan wees op Suid-Afrika om die werksvloer te vernietig. Ek wil vir u se dat die aanslag op die werksgebied gaan baie erger wees as die aanslag op die militêregebied want as hulle ons ekonomies kan laat val, dan het hulle presies bereik wat hulle wil. Nou is dit ongelukkig so dat die werkgewer gedurig daar reaktief optree. Hy wag eers dat die vakbond hom slaan en dan spring hy terug en dan begin hy reageer op die situasie. Dis baie jammer as dit so is. Die werkgewer hoort inderdaad eintlik proaktief op te tree en seker te maak dat teen die tyd wat die vakbond hom slaan is hy lankal gereed om hierdie situasie te hanteer. Hy hoort stelsels te implementeer, hy hoort prosedures te implementeer, reg van die begin af wat maak dat die aanslag van die vakbond hom nie met sy broek op sy skoeve val nie soos wat u netnou hier gesê het nie. Met ander woorde proaktiewe optrede en vooruit dink, "hoe gaan ek die vakbond hanteer? Watter soort van diensvoor-

waardestelsels moet ek in hê?" Pasop vir onbillike arbeidspraktyke soos in my stelsels. Al hierdie tipes van proaktiewe optrede is baie beter as wanneer ek my heetleemal flou skrik wanner die vakbond die eerste keer my kantoor binnestap, so ek wil met u baie sterk daaroor saamstem maar oor die huidige arbeidstelsel in Suid-Afrika, gebaseer op onderhandelings praktyke wat ek glo baie sterk daaraan want ek glo Suid-Afrika se toekoms gaan inderdaad op die onderhandelingsvlak besluit word.

Mnr Anderson, u het 'n vraag oor konflik deur kompromie. Ek wil vir u 'n baie belangrike ding sê. Ek glo nie dat wanneer ek in 'n onderhandelings situasie instap dat ek daar moet ingaan met die gedagte dat ek sogenaamd met die mense onderhandel uit 'n posisie van krag. As ek uit 'n posisie van krag onderhandel, mnr Anderson, wil ek voorskryf, ek wil nie onderhandel nie. Ek moet by 'n onderhandelingsstafel in gaan met 'n oop agenda waar ek weet dit is die dinge waaroor ek kan onderhandel en ek moet luister na die opposisie en weet dat hy moet bereid wees om na my ook te luister en dan gaan ons by die antwoorde uitkom wat waarskynlik vir ons beide die beste gaan wees. Dit gaan nie noodwendig die oplossing wees altyd wat vir my die beste is nie maar vir my en vir hom en die gesamentlike organisasie gaan ons waarskynlik by die beste antwoorde uitkom. So ek dink nie dat ons hierdie situasie moet hê waar ons dink dat as ons onderhandel dat ons noodwendig net altyd uit 'n posisie van krag uit onderhandel nie, kompromie is belangrik.

Training of the shop stewards workforce, yes by all means. It is important to understand that we must also be proactive in training the trade union people who work for us, especially those who are workers, who are not necessarily involved in the trade union themselves, they could be members, that we train them in good negotiating tactics, that we train them in human relations and all these things because they also relate to our actions with the result that training over the total field of the spectrum I think is absolutely essential. Baie dankie.

#### MNR DICK JORDAAN: VEREENIGING

Lê die oplossing nie in dat ons miskien eenvoudige diensvoorwaardes so gou as moontlik afgekondig kry nie. Dan gaan ons meeste van die probleme wat tans ondervind met die arbeidsverhouding dalk kan oplos. Dankie.

#### MNR J VAN DER MERWE

Mnr die President ek wil vir u sê, dat ek nie een van daardie mense is wat eenvoudigheid as sodanig net eenvoudig altyd voor staan nie, omdat plekke van plek te plek verskil. Dit is 'n feit van die lewe.

Elke slag as daar 'n verskil in aktiwiteit is, dan kry jy daardie gaping wat ontstaan en daarom vind jy baie keer dat ons ook vir u sê dat ons wil graag eenvoudige diensvoorwaardes hê.

In Transvaal het ons dit nou al. Die Kaap is reeds besig om in die rigting te beweeg, en ek dink in die Vrystaat en Natal, sal ons seker binnekort in die rigting kan gaan, waar ons kan kyk na eenvoudige diensvoorwaardes vir die meeste items.

Maar dan moet daardie diensvoorwaardes so eenvormig wees.

#### GRONDWET: VOORGESTELDE WYSIGINGS

##### DR NICO BOTHA: BLOEMFONTEIN

Mr President, as we all know, Clause 17.7 of our Constitution reads: "to appoint ad hoc committees of members of the Executive Council and to define their terms of reference and powers". As it stands today, Mr President, it means that only members of the Executive Council can serve on ad hoc committees. Surely there are other engineer members capable and willing to serve on these committees as well. Therefore, Sir, I would like to propose, on behalf of the Executive Council, an amendment to Clause 17.7 to read as follows: "TO APPOINT AD HOC COMMITTEES OF MEMBERS AND TO APPOINT MEMBERS AS REPRESENTATIVES ON OTHER COMMITTEES AND TO DEFINE THEIR TERMS OF REFERENCE AND POWERS".

In die tweede plek, mnr die President, wil ek daarop wys dat

dat as daar dan spesifieke verskille by 'n spesifieke plek geïdentifiseer word, wat anders is as by die res, dat daar wel die nodige goedkeuring en sanksies gegee kan word dat daardie plek anderste kan wees.

In ander woorde, jy moet nie so totaal oorspronklik optree in jou eenvoudigheid nie, dat jy dink dat daar nie voorsiening sal wees vir verskille by plekke nie. Maar ek glo persoonlik dat in die mannekrag situasie, die wetgewing situasie, daar 'n groot veiligheid vir die werkgewer in lê indien daar eenvoudigheid is.

#### MRE G DAVIES: PIETERMARITZBURG

I note from your paper that you say that unfair labour practice is such, that an employer or class or employees, is or may be unfairly affected, or that his employment opportunities, work security, physical, economical or social welfare is or may be prejudiced or jeopardized thereby.

Now the question I have to ask really is, if this definition includes the remuneration of Town Clerk's Act completely - which must be labelled as far as I am concerned "Unfair Labour Practice", would you agree with that to start with - and if so, if you have a grievance in terms of the remuneration of Town Clerk's Act can you base a case on the fact that the whole Act is an unfair labour practice.

#### MJR J VAN DER MERWE

Mr President, I want to react by saying that the remuneration of Town Clerks Act, is a typical example of where the two parties - the employer and the employee - have the opportunity over many years to sit down together and negotiate something for themselves. But because they did not do that, we suddenly have the situation, that when things got out of hand, the State stepped in and they then wrote the necessary legislation to control this whole operation.

If the two parties had, over the years, sat down and negotiated this type of thing for themselves, you would not have had a situation where the Administrator suddenly had to come in and determine the salary and now the situation where the new Act comes in, or the previous act which said that the Remuneration Advisory Committee must handle this situation. It is not an unfair labour practice per se, because the law is specifically written that way.

But I do think we can accept one thing, and this is, that the new concept, the way that the law is now going to be changed, or the legislation is going to be changed, whereby the employer and the employee will be able to sit down and negotiate this type of thing.

I expect that this legislation should be going through Parliament during the course of this year still, and this will then mean that the Remuneration Council will be instituted and there in that specific Council the Federation of Municipal Employer Organizations will then be able to sit down with the Trade Union - this is the Trade Union of Town Clerks, they call themselves FAPO, we call them SWAPO - and the Federation of SAAME Union will be able to sit down and negotiate this thing for themselves.

klausule 24.5 van die Grondwet bepaal dat: "...die kworum vir vergaderings vir takke vyftien lede is; met dien verstande dat verteenwoordigers van ten minste tien lidondernemings teenwoordig is".

Mnr die President, dit is so dat sommige takke oppervlakte gewys, soos byvoorbeeld Natal, Oos-Kaap, Vrystaat en Noord-Kaaplandtakke, geweldig groot is. Wat dit uit die aard van die saak vir sodanige takke baie moeilik maak om te alle tye vyftien lede teenwoordig te kry. Ek wil derhalwe voorstel dat klausule 24.5 gewysig word om soos volg te lees: "ONGEAG ENIGE ANDERS LUIDENDE BEPALINGS VAN HIERDIE KLOUSULE IS DIE KWORUM VIR VERGADERINGS VAN TAKKE, TIEN LEDE".

Die voorstelle is geskondeer deur mnr Jules van Ahlfen en eenparig aanvaar.



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# STANDAARDSPANNING VIR LAESPANNINGELEKTRISITEITSVOORSIENING

deur C.A. Anderson, Elektrotegniese Stadsingenieur, Pretoria



Mr C Anderson

## 1. INLEIDING

Die ekonomiese voordele wat voortspruit uit die rasionalisering van toerusting en ontwerpe is seker een van die belangrikste faktore vir die motivering van standaardisasie. As die groot marktaandeel van laespanningstoerusting in aanmerking geneem word, is dit te verstaan waarom die standaardisering van laespanningtoerusting en -stelsels hoë prioriteit sal geniet. Om laespanningstelsels effektief te kan standaardiseer is dit nodig dat die nominale stelselspanning van laespanning-elektrisiteitsverspreidingsnetwerke, nie alleen nasionaal nie, maar ook internasionaal gestandaardiseer word.

## 2. INTERNASIONALE MILIEU

Onder leiding van die Internasionale Elektrotegniese Komitee, het 'n tegniese werkgroep die standaardisering van spannings, stroomaanslae en frekwensies deeglik ondersoek.

Gedurende 1981 het die Nasionale Komitees van verskeie lande (waaronder dié van Suid-Afrika) die aanbevelings van die IEK se Tegniese Komitee nr 8 ten opsigte van standaardspannings aanvaar. Aanvaarding van die IEK-aanbevelings kom neer op internasionale konsensus en aanvaarding van die IEK-voorstelle vir internasionale (en dus ook nasionale) gebruik. Die IEK-aanbevelings is vervat in IEK-publikasie 38 van 1983 met die titel "IEC STANDARD VOLTAGES". Die aanbevelings ten opsigte van laespanningverspreidingsstelsels is vervat in Table I van die IEK-dokument en die tersaaklike inligting kan kortliks soos volg opgesom word:

- Dat die IEK-standaard nominale stelselspanning vir driefase-, vierdraad-laespanningstelsels 230/400 V sal wees.
- Dat bestaande 220/380V- en 240/400V-stelsels aangepas moet word om te ontwikkel tot die aanbevole IEK-standaard 230/400V-stelsel.
- Dat die oorgangsperiode vir die aanpassing van nie-standaardstelsels so kort as moontlik gehou moet word en nie 20 jaar vanaf die uitreiking van die IEK-publikasie 38 moet oorskry nie.
- Dat, as 'n eerste stap tydens die oorgangsperiode, elektrisiteitsvoorsieningsowerhede in lande met 220/380V-stelsels, die stelselspanning sal aanpas binne die bestek van 230/400 V plus 6% tot minus 10% en dat owerhede

met 240/415V-stelsels hulle stelselspanning sal aanpas om dit binne die bestek van 230/400 V plus 10% tot minus 5% te bring. Die gedagte is dat 'n eenvormige stelselspanning van 230/400 V met 'n toleransie van plus en minus 10% aan die einde van die oorgangsperiode bewerkstellig sal wees.

- Dat 'n verdere vermindering in die toleransie van die stelselspanning daarna oorweeg sal word.

Wat die internasionale gemeenskap betref, kan gesê word dat daar by wyse van konsensus op 'n strategiese, aksieplan en skedulering ooreengekom is vir die internasionale standaardisering van die nominale stelselspanning van laespanningverspreidingsnetwerke. Die vraag is of die voorgestelde standaardspanning in werklikheid wêreldwyd ingestel sal word. Skrywes oor die internasionale neigings na 'n standaardspanning van 230 V is gedurende Mei 1987 deur die Direkteur-generaal van die SABS aan verskeie oorsese instansies, waaronder die Sekretaris van die IEK se Tegniese Komitee nr 8, gerig. Dit word aanvaar dat die status quo oorsee nog steeds onveranderd gebly het.

## 3. NASIONALE MILIEU

In Suid-Afrika het daar oor die jare heen verskeie elektrisiteitsondernemings tot stand gekom en so ook 'n verskeidenheid van stelselspannings. Na die promulgasie van die Regulasies onder die Elektrisiteitswet (Wet nr 40 van 1958) was daar 'n konvergensie van verklaarde stelselspannings na 220/380 V vir driefase- vierdraadwisselstroomstelsels soos neergeleg in Regulasie 24.(1)(a) onder die Wet. Daar is egter twee munisipaliteite, naamlik Port Elizabeth en Pretoria, wat hul laespanningsverspreidingsnetwerke met verganning van die Elektrisiteitsbeheerraad kragtens Regulasie 24.(4) onder die Elektrisiteitswet teen ander spannings bedryf.

Voortspruitend uit 'n poging tot nasionale standaardisasie van spannings onder leiding van die Suid-Afrikaanse Buro vir Standaard oor die afgelope sowat 12 jaar, word die volgende drie nominale standaardspannings vir driefase- vierdraadwisselstroomstelsels in SABS 1019 - 1985 erken, naamlik:

- (a) 110/190,5 V
- (b) 220/380 V
- (c) 230/400 V

Die eersgenoemde spanning word hoofsaaklik ondergronds in myne gebruik terwyl die laasgenoemde twee spannings bedoel is as nominale stelselspannings vir laespanningverspreidingsstelsels. Vanuit 'n nasionale standaardisasie-oogpunt is daar dus tot dusver nog nie konsensus oor 'n enkele nasionale standaardspanning vir laespanningverspreidingsstelsels nie.

As daar gekyk word na die inligting wat in die Amptelike Suid-Afrikaanse Munisipale Jaarboek ten opsigte van elektrisiteitsondernemings verskyn, dan blyk dit dat die meeste munisipaliteite 'n verklaarde nominale stelselspanning van 220/380 V vir hulle laespanningsverspreidingsstelsel het. Dit wil egter voorkom asof 'n hele aantal munisipaliteite 230/400V-stelsels bedryf. Van hierdie inligting kan moontlik foutief wees vanweë 'n moontlike verwarring tussen verklaarde nominale stelselspanning en die nullaspanning van transformators wat gebruik word.

A.A. Middlecote (VMEQ tegniese vergadering - Oktober 1983) wys daarop dat ofskoon baie elektrisiteitsvoorsieningsowerhede 'n verklaarde stelselspanning van 220/380 V het, slegs enkele in werklikheid elektrisiteit teen (of naby) die verklaarde spanning lewer.

Hy toon ook verder aan dat 'n ondersoek in 'n baie groot munisipale onderneming met 'n verklaarde nominale stelselspanning van 220/380 V aan die lig gebring het dat die mediaanspanning baie naby aan 230/400 V bevind is en die persentasie-afwykings meer as 10% is.

Wat die nasionale milieu betref, kan die situasie soos volg opgesom word:

- Suid-Afrika het nie op net een enkele standaardspanning vir laespanningstelsels gestandaardiseer nie en konsensus of 'n besluit om so te doen is nog uitstaande.
- Die meeste elektrisiteitsvoorsieningsowerhede in die land bedryf laespanningsverspreidingsstelsels teen 'n nominale stelselspanning van 220/380 V wat nie 'n IEK-erkende standaardspanning is nie.
- Hoewel baie munisipaliteite 'n verklaarde nominale spanning van 220/380 V het, wil dit voorkom asof daar nie baie munisipaliteite is wat daarin slaag om elektrisiteit binne die voorskryfte van Regulasie 24.(1)(a) van die Elektrieswet te lewer nie.

Omdat bykans alle Suid-Afrikaanse elektrisiteitsvoorsieningsowerhede in die VMEQ verteenwoordig is, en baie geaffilieerdes die VMEQ-konvensie bywoon, is dit sekerlik die geskikte forum om oor standaardisasie te praat en om op 'n breë, verteenwoordigende grondslag, onder 'n oorkoepelende liggaam, oor strategie en aksieplanne te besin.

#### 4. MOONTLIKE ALTERNATIEWE

Voordat 'n besluit geneem kan word moet die volgende vier alternatiewe oorweeg word:

*Alternatief a:* Behou die huidige 220/380, 240/415 en 250/433V-toevoerspannings onveranderd.

Die huidige gebrek aan eenvormigheid sal dan voortduur en geen ekstra kapitaalkoste sal vir die plaaslike owerhede meegebring word nie. Die versteekste kostenaandeel vir die verbruikers vanweë gebrek aan standaardisasie is moeilik berekenbaar, maar sal 'n groot bedrag beleef.

Aangesien die behoeftes van die verbruikers nie deur hierdie alternatief bevredig word nie, kan dit nie gesteun word nie.

*Alternatief b:* Standaardiseer op 'n nominale stelselspanning van 230/440 V.

Die belangrikste voordeel is standaardisering op 'n internasionaal aanvaarde waarde.

Hierdie alternatief hou 'n groot kostenaandeel vir bykans alle voorsieningsowerhede in.

Gesien in die lig van die stryd teen inflasie sal hierdie alternatief nie die steun van die regering geniet nie.

*Alternatief c:* Behou 220/380 V en laat 240/415 en 250/433 V na 220/380 V daal.

Hierdie alternatief hou sulke enorme groot kostenaandeel vir Port Elizabeth en Pretoria in dat dit nie op hierdie tydstep as gangbaar beskou word nie.

Dit sal egter wys wees indien voorsiening vir hierdie alternatief by die aankoop van transformators gemaak kan word.

*Alternatief d:* Behou 220/380 V en laat 240/415 en 250/433 na 230 V daal.

Hiermee sal Suid-Afrika faal in sy onderneming om die IEK se aanbevelings ten opsigte van 'n internasionale spanning uit te voer. Slegs Port Elizabeth en Pretoria sal kapitaalkoste moet aangaan. Die gangbaarheid van hierdie alternatief vir hierdie twee stede sal verder ondersoek moet word, maar op die oog af lyk dit na die enigste geskikte alternatief wat tans prakties implementeerbaar is.

#### 5. AANBEVELING

Daar word aanbeveel dat die VMEQ soos volg besluit:

1. Dat die bestaende twee standaardspannings van 220/380 V en 230/400 V van SABS 1019 - 1985 onveranderd behou bly.
2. Dat Port Elizabeth en Pretoria indien moontlik hul verklaarde spanning na 230/400 V laat daal en voorsiening maak vir 'n moontlike uiteindelijke daling na 220/380 V.

#### MNR C ANDERSON: PRETORIA

Die standaardisering van spanning laat my dink aan daardie grappie waar die klomp ouens toe moes besluit wat is die oudste professionele. Uiteindelik het hulle toe besluit die oudste professionele is die van die Politikus, want in die begin was daar chaos.

Nou wat die standaardisering van spanning betref lyk dit vir my ook daar was in die begin chaos, want ons het gister verneem toe Minister Pietie vir ons gesê het dat by die eerste vergadering van die VMEQ, een van die eerste besprekings-punte, die van die standaardisering van spanning was.

Ek is baie bly mnr President dat u tyd ingeruim het vir die bespreking van standaard-spanning hier in Kaapstad. Dit is 'n aangeentheid wat huidige ook van belang is vir Port Elizabeth en ook vir Pretoria, maar indirek ook vir almal van u natuurlik.

Aangesien die geskiedkundige agtergrond aan u almal bekend is, ons het dit in die stuk uiteengeset na die beste van ons vermoë, wil ek nie nou lank daarby stilstaan nie en ek wil graag soos wat 'n mens moet doen by komplekse besluitneming, kyk na die alternatiewe wat aandag behoort te geniet.

Heel eerstens kan ons 'n baie maklike uitweg volg en net eenvoudig niks doen nie en so die status-quo handhaaf. Maar dit sal natuurlik nou nie in die belang van ons verbruikers wees nie, en ons is natuurlik ingestel op die behoeftes en belange van ons verbruikers. Dit is hoekom ons daar is.

Tweedens kan ons landswyd op die internasionale voorgestelde waarde van 230/440 V standaardiseer, maar ongelukkig dink ek is dit nou vanuit 'n koste-oppunt nie gangbaar nie. Maar dit kan dalk wees, maar ek betwyfel dit ten sterkste dat u so vol-entoesiasme is daaroor dat die verloop van die gesprek dalk heeltemal 'n ander wending kan neem.

Mr President the third alternative is for Port Elizabeth and Pretoria to lower their declared voltage to 220 V and also unfortunately, due to the cost involved, this alternative does not appear to be feasible at this stage.

Finally, the only viable alternative appears to be for Port Elizabeth and Pretoria to lower their declared voltage to 230 V, as an interim measure with provision for an ultimate value of 220 V, to come in line with the rest of the Country.

Mr President, my proposal is therefore as follows:

Firstly that the two standard voltages of 220 and 230 V, I am only giving the single phase voltages now, as laid down in SABS 1019 of 1985 be retained, and secondly that Port Elizabeth and Pretoria give consideration to lowering their declared voltage to 230 V at this stage, with provision for an ultimate lowering to 220 V.

Dankie mnr die President dat ek hierdie voorstel kon deurgee.

#### PRESIDENT:

Dankie mnr Anderson. Ek meen hierdie gesprek kan seker baie bespreking uitlok en ek wil eers mnr van Alphen van die SABS vra om 'n bydrae te maak en daarna lyk dit vir my wil mnr Charles Adams ook praat.

#### MR C VAN ALPHEN: SABS

I think mr Anderson put it very clearly that we have a big problem in this country, but it is also a world problem. It is a world problem insofar that many countries have 220 Volt. And many countries have 240 V, like Great Britain. And everywhere there is great concern as to how to move to 230 V. It is all very beautiful, you can preach unity and you can preach that 230 V is the

ideal voltage, but to effectively implement this, is a big job.

Now recently, as was written in Mr Anderson's report, you find that Britain for instance have voted against the implementation eventually of 230 V plus or minus 6%. Italy also had voted against accepting 230 V because they are on 220 V and both countries say that it is just not economically feasible to do this.

Now the crux of the matter lies in this. I have said that we should try to standardise to 230 V plus or minus 10%. Now when you do this, then of course everybody falls in line. Or at least almost everybody, because 240 V plus 6% is the same as 230 V plus 10%, and the same applies to 220 V. So if we can standardise on 220 V minus 6%, you might as well say you are 230 V plus or minus 10%.

Well you can see great dangers in this. As soon as we would state in the Act that the standard voltage of this country is 230 V, I think we might get tremendous confusion. Because then people would start making things to 230 V and low and behold most of these appliances would be used at 220 V systems, which might even drop below the minus 6%.

Now the whole issue really hinges on the definition of voltage drop and especially in today's cost consciousness, one might have to look into a bigger voltage drop than plus or minus 5%, as presently stated in the Act. I believe that Eskom have already, in certain regions, accepted plus or minus 7,5% and certain representations have been made to the Bureau that we should really try to formulate a new Act for implementation that would at a voltage variation of plus or minus something, greater than 5%.

Now Mr President the problem is thus, to move from 220 V to 230 V would indeed create chaos insofar that we have already standardised in distribution transformers at an output voltage of 240 V, which is really very nice if it gives you 200 V at your supply terminals under load. If we were to change this, it would really be contrary to good standardisation.

I think the first step that must be taken is to really try and limit the voltage drop in 220 V systems, so that we would certainly not go under the level of 220 V minus 6%. I would try to move up but you can see if we accept 230 V you would get the following situation. People would then start overfluxing the transformers. You would push up their compounded losses quite considerably. You would push up noise levels, you will get people that will say the mini-sub is making a noise I cannot sleep and you will also find the inverse current, if you switch on, will be considerably weaker because most transformers are constructed quite close to the knee of the mechanisation curve. As soon as you start switching in on transformers, in an overflux condition, you certainly will have a much higher inrush current.

So Mr President I think it is a question that Mr Anderson has raised that really needs very thorough thought. I am very glad to hear from Attie van den Berg that two members have been appointed to represent the AMEU, and specially to represent the interest of Pretoria and Port Elizabeth.

But I think that Mr Anderson really makes a very pragmatic proposal. His pragmatic proposal is that you should not touch the 220 V system at this stage, but that we should approach the 240 V first and see whether they cannot reduce it to 230 V. At least then we have gone a step in the right direction and come closer.

I am not sure whether his next proposal, that we should even consider Pretoria and Port Elizabeth to drop to 220 V should be implemented. I think this is a matter that we should now discuss in great depth, especially this combination of how we see on a cost effective basis, the voltage drop difference especially in the Act.

Mr President in closing and as President of the SAIEE, I have in fact forgotten to congratulate you on your appointment as President of AMEU and it gives me great pleasure to do this, because Mr Fortmann has also been so very active in the SAIEE. As a matter of fact, he is a very active member of our Power Section, and I hope indeed that our happy friendship and close co-operation will last for many years.

Thank you Mr President.

**PRESIDENT:**

Thank you Mr van Alphen.

**MR C ADAMS: PORT ELIZABETH:**

Mr President I am very pleased that Mr Anderson has submitted this topic for discussion as it is a serious problem for Port Elizabeth. Our voltage in Port Elizabeth is 250 V and we have for many years been considering changing this to a more standard voltage, and in this respect we need some assistance from Engineers from other towns.

Vir ons is die probleem nie of ons die spanning moet verander of nie. Die besluit is alreeds geneem. Ons moet die spanning verander. Die vraag eintlik is, watter nuwe spanning ons moet kies. Die nuwe internasionale spanning is 230 V en ons Suid-Afrikaanse standaard is 220 V, en wat ek nou wil weet is, hoeveel die ander ingenieurs dit oorweeg om sy dorp se spanning te verander na die internasionale spanning van 230 V.

Mr President quite simply, if there is no move to bring South Africa's standard voltage into line with the international standard, I must change Port Elizabeth's voltage from 250 to 220. If however there will be a move to 230 in South Africa I must rather choose 230 for Port Elizabeth.

I would very much like to ask any Engineer here who is considering changing his town to 230 V to please raise his hand so that I can assess which voltage will be the best choice for Port Elizabeth.

Mnr die President ek wil graag weet of enige Ingenieur dit oorweeg om sy dorp se spanning te verhoog of nie, dit sal vir my baie help. Dankie.

**PRESIDENT:**

Thank you Mr Adams. Before we put that to the general audience, I would just like to pose a question. You have a 230 or 400 V/231 V system, which as I see it would be the system voltage. But then you have the next step which is a declared voltage to the consumer. I would think that the declared voltage is probably the 220 V and 38/220 V is then the declared voltage. That is how I would visualise it. In other words the transformers you buy would have a secondary voltage of 231, 400/231 but your consumer who uses that voltage, you declare to him that the voltage is 380/220. I wonder if we could just get an indication from Mr van Alphen if this is possibly the way one looks at this or not. Am I on the wrong track?

**MR C VAN ALPHEN: SABS**

Mr President, quite correct, the standard no-load voltage of distribution transformers is 400/231 V which is on the upper range, and with volt drop you will then have a declared voltage at your consumer terminal of 220/380. If we were going to 230 V as a declared voltage then we would have to change the standard of distribution transformer no-load voltage to something like 420 V or more.

**PRESIDENT:**

So with that in mind I would imagine that the majority of users, use a system voltage of 400/231 and a declared voltage of 380/220. Mr Adams is that the question you would like answered?

**MR C ADAMS: PORT ELIZABETH**

Mr President, really the question that I would like answered is, is any Engineer considering changing his town's declared voltage from 220/380 to 230/400.

**PRESIDENT:**

Is anyone in the audience intending to change the declared voltage now from 380/220 to 499/237? It does not seem so.

**MR C ADAMS: PORT ELIZABETH**

Well that seems to give me the answer I am looking for. Now I should look at changing Port Elizabeth to 220 V. Thank you.



#### MR K ROBSON: EAST LONDON

Mr President may I ask mr van Alphen whether or not he believes that internationally the 230 V plus or minus 10% is likely to be accepted, because if there is a move internationally to this voltage then obviously we need to look at the implications here.

#### MR C VAN ALPHEN: SABS

Mr President the situation is not clear. The European countries tried to standardise and they put forward a motion to accept 230 V plus or minus 6%. This was rejected by the weight of votes by Britain and Italy. Now it is referred back to the IEC. I think IEC's intention is still in the long term to go to 230 V and also Europe is prepared to accept it but not with plus or minus 6%. Then they say it must be plus or minus 10% and I think you are going to get confusion, because it is one thing if appliances can take plus or minus 10%, and often appliances are really designed just to the bone. You either buy a 240 V appliance or you buy a 220 V appliance. So if you can see that the South African appliance market will move towards 230 V, comfortably operating at a 220 V system and 240 V system, I think then we can go to 230 plus or minus 10%. But I think that is a first stage that really has got to be reached.

#### PRESIDENT:

Mr van Alphen before you leave, is the plus or minus 6% from 230 V, the declared voltage or the system voltage?

#### MR C VAN ALPHEN: SABS

No mr President it is actually declared voltages. IEC talks about this as the declared voltage at the consumer terminal which should move to 230 V. Now at plus or minus 10% and at some future date, I think in the year 2006, or something like that, at plus or minus 6%. Now it is this last point that is being argued about at the moment. The European community has not reached agreement on this particular point of accepting 230 V plus minus 6%.

#### PRESIDENT:

Thank you mr van Alphen. I believe personally that it is important that in this sort of thing standards be maintained and kept and be striven for.

#### MR DH FRASER: DURBAN

Apart from the question of standardising on a declared voltage I think the question of permissible voltage regulation at the consumers' terminals is one which really needs to be examined as well.

The present regulations specify plus or minus 5%, unless there is an agreement with the consumer to the contrary, and as mr van Alphen mentioned Eskom in some regions anyway, maintain that they have an agreement with the consumer to vary that

5% to plus or minus 7%.

Now to what extent the consumer really is in agreement therewith is questionable, and I think that because it has an important influence on the cost of providing electricity to a consumer, that there should be some national standardisation on this issue. If plus minus 7.5% is acceptable, surely it is not only Eskom consumers that find this acceptable, and it would make a tremendous difference to the cost of all municipal reticulations if they worked to this limit.

Now I would find it difficult to imagine that a consumer who is taking supply, that I can specify in my application form, that the voltages are liable to vary plus or minus 7% that the consumer cannot go to another supplier if he does not particularly like that condition so it does seem a bit of a unilateral decision to my way of thinking. I think this really is something, that whoever is dealing with the question of a standard voltage and the possible variation thereof that should be examined and I suggest it is something that the AMEU should recommend. Thank you mr President.

#### PRESIDENT:

Thank you mr Fraser. There are obviously two matters under discussion and consideration. There is first of all the standard voltage and then secondly the variation. What variation should be permitted. Mr van Alphen?

#### MR C VAN ALPHEN: SABS

I just replied to that mr President. It is exactly what this committee wants to look at and heed the very strong pressure that we must not only look at standard voltages but we must really look at the whole package. The pressure upon us at the moment is very strong indeed that we should really go so far as to try and persuade the Department to change the Electricity Act.

I agree entirely with what mr Fraser is saying. To have an electricity Act stating plus or minus 5% and everybody else saying in their contracts – no we do differently – really makes a mockery of the Act. There should be a reasonable standard for the country and under certain circumstances you should be allowed to have some minor deviations only.

#### MNR C ANDERSON: PRETORIA

Mnr die President, ek wil net graag baie dankie sê vir al die kongresgangers se bydraes. Ons het natuurlik in Pretoria ons spanning alreeds laat daal van 250 na 240 en ons het dit gedoen sonder groot onkoste, en dit is miskien iets wat 'n mens in gedagte kan hou. Dat jy dit eerder in stappe moet doen in plaas van om direk te daal na 220. Dit is 'n moontlikheid wat Port Elizabeth ook dalk kan oorweeg. Ek het eintlik geen bydrae ten opsigte van die uiteindelijke waarde nie. Dit lyk vir my ons land sal uiteindeelik tog maar standardiseer op 220 V. Baie dankie mnr die President.

## VACUUM INTERRUPTERS AND THEIR APPLICATION IN VACUUM SWITCHGEAR FOR DISTRIBUTION VOLTAGES

J P Speedy – GEC Switchgear Company

### INTRODUCTION

This paper deals with:

- The vacuum interrupter process.
- Advantages offered by vacuum.
- The application of vacuum circuit-breakers to municipal distribution.
- Future developments.

### VACUUM INTERRUPTION

Figure 1 shows a cross section of a typical vacuum interrupter,

which consists essentially of two butt type contacts that can be separated in a high vacuum environment. The vacuum is contained within an insulating envelope. A flexible metal bellows allows the movement of contacts relative to one another.

When current carrying contacts are parted in a high vacuum, an arc is drawn between the contacts. The arc vapourises contact material and it is this metal vapour that provides a conducting path between the contacts. The amount of metal vapour produced is dependent on the current flowing in the arc. In an alternating current circuit the quantity of metal vapour reduces as



Mr John Speedy, General Manager, GEC Switchgear, delivering his paper on "Vacuum Interrupters and their application in Vacuum Switchgear for Distribution Voltages".

the current approaches zero, with re-condensation exceeding generation. At some low value of current the arc becomes unstable and is extinguished. All remaining vapour rapidly condenses to leave a high dielectric strength vacuum gap between the contact faces.

Plain butt type contacts can be used to break currents up to 7kA but for currents above this value the arc becomes constricted, i.e. concentrated at particular points on the contact surfaces. For successful high current interruption it is necessary to create a magnetic field to break the arc up into a number of smaller parallel arcs or to ensure continuous movement of the constricted arc which then reverts naturally to smaller parallel arcs before current zero. Circuit-breaker interruptors therefore have specially shaped contact arrangements to create the magnetic field for arc control.

Contact material also plays an important part in vacuum interruption. It is necessary to have a material that maintains arc stability down to low currents to keep current chopping transients to a low value. The material must also have good arc resistance, anti-weld properties and conductivity.

Whilst inherently simple in principle, vast resources have been expended on achieving optimal performance and cost, by way of design, development, and the selection and formulation of materials.

#### ADVANTAGES OFFERED BY VACUUM

##### Very Long Interrupter Life.

With vacuum, open contact gaps can be kept very small (typically 8 mm for 95kV BIL). Since arc interruption depends on the condensation of metal vapour, which occurs naturally in a very short time at current zero's, there is no need to lengthen the arc as in other interrupting media to achieve the required cooling and de-ionisation of the arc plasma.

Arc energies are therefore uniquely low. In addition to this material vapourised from the contacts is not contaminated and is in the main re-deposited on the contact surfaces and available for re-use. Arcing times are also very short and virtually independent of the load power factor.

The result of all this is an interrupter that can typically handle between 50 and 100 full fault interruptions and 10 000 load interruptions before it requires replacement with of course no need for any interim attention. In municipal applications the interrupter will outlast the application. Should however, through exceptional circumstances, replacement be necessary, this is a simple operation requiring no special skills.

##### Reliability

Even in volume production, the manufacture of vacuum interrupters involves a small team working under carefully controlled conditions and the final product on a 100% basis is subjected to tests which come uniquely close to confirming its ability to perform correctly in service and prove its ability to maintain the

required degree of vacuum over its long life. As no bolted or sliding seals are involved and since there are fewer component parts compared to other interrupting technology, it is not surprising that very high levels of safety and reliability have been achieved.

Problems experienced in the early years with certain interrupters, i.e. ineffective outgassing and corrosion in certain hostile environments have long been solved. Furthermore, the switching life of vacuum interrupters is sufficiently long to make the sealed for life and hence sealed in factory quality level totally economic.

With some 20 000 interrupters supplied over the past 8 years by GEC in South Africa, we are not aware of a single replacement being necessary as a result of the switching life having been exceeded. Cases of loss of vacuum have been rare and either due to historic (now corrected) problems or as a result of gross mechanical damage to the circuit-breaker as a whole.

#### Economies

With the worldwide dominance of vacuum, spends on Research and Development are considerable and improvements in performance and cost are coming forward on a regular basis. For example interrupters initially designed for interrupting 12.5kA with detailed improvement, are now considered oversized for 31.5kA.

The interrupting process in vacuum does not depend on mechanism power and hence standard low power mechanisms may be applied across a comprehensive range of switchgear.

Whilst, when first introduced, vacuum circuit-breakers were considerably more expensive than oil circuit-breakers, improvements as above have at this time totally eroded this cost differential. This means that taking into account reduced maintenance requirements, an overall cost reduction to the user has been achieved. This trend will continue.

#### Switching Performance

The vacuum interrupting process, however, ensures optimal interruption (without compromise) across a uniquely wide range of power factors and currents. It does, however, produce on a more regular and controlled basis, albeit of similar magnitude and rise time to SF<sub>6</sub>, sharp fronted switching transients. This characteristic of the technology enjoys considerable commercial exploitation by promoters of rival technologies. The facts of the matter are that no switching device yet developed can be applied without precaution across the whole spectrum of possible applications and it is impossible on a scientific base to make significantly different general recommendations for either technology.

#### Health and Safety

No toxic products are produced as a result of the normal or abnormal operation of vacuum interrupters. Although X-rays can be produced by a vacuum device at sufficiently high voltages, careful control of contaminants and 100% factory tests ensure that no danger from this effect will be evidenced under service or routine test conditions.

Due to the small contact gaps that can be employed in vacuum interrupters, the arc energies are exceptionally low. This makes them inherently safer and gives them much greater electrical life than any alternative interrupter devised to date. In addition, the vacuum envelope does not behave as a pressure vessel and no explosion results from abnormal conditions.

If in addition to the above, attention is given in the switchgear housing design, to safe venting of arc products in the event of internal arc faults, maximum operator safety is achieved.

#### SWITCHGEAR DESIGN

It is important to compliment the vacuum interrupter with improvements in overall equipment design to provide the user with an optimum package. In this connection the following improvements are of interest:-

- Equipment size reductions have been achieved. (Photograph 1.)
- The installation of main cables and busbars has been simplified. (Photograph 2.)
- Pilot cable installations and glanding can be achieved with-

out needing access to high voltage compartments. (Photograph 3.)

#### GENERAL ACCEPTANCE OF VACUUM SWITCHGEAR

At voltages up to 36 or 52kV, vacuum switchgear is totally viable. At high voltages SF6 has distinct advantages and is the accepted modern technology option.

At 12kV, it is not surprising, bearing in mind the many strong features mentioned above, that vacuum is dominating the world market, both in the context of sales and in the number of major manufacturers who are committed to this technology, or are changing to vacuum having started out with the other new technology options.

#### SUITABILITY FOR MUNICIPAL APPLICATIONS

When first introduced vacuum switchgear was considerably more expensive than oil. Whilst, as was the case, we expected users with arduous applications and special safety requirements to be the main purchasers of vacuum switchgear, we were pleasantly surprised by the interest of many municipalities who, particularly for main substations, were able to see the advantages of vacuum switchgear. As the cost premium has reduced, this interest has widened to the extent that oil circuit-breakers sales have rapidly fallen and now only represent some 20% of our total sales.

Vacuum circuit-breakers offer the greatest advantage when arduous switching duties are involved and are particularly suited to auto-reclose applications.

The very high rate of dielectric recovery inherent in the vacuum interruption process is an advantage in achieving re-strike free switching of capacitor or cable charging currents, and their low and controlled current chopping level means that they are well suited to the switching of lightly loaded transformers.

Opening and arc interruption times are also very short and do not significantly change with load or fault current or power factor. This allows closer time grading in distribution systems and hence allows faster fault clearance to be achieved.

#### FUTURE TRENDS

Whilst improvements in vacuum interrupters have been ongoing, some exciting step changes are on their way. As mentioned it is necessary to control the vacuum arc by means of a suitable magnetic field. In this context, by combining the strong points of two previously used techniques – the spiral petal which produced strong arc rotation, and the conrotate which produced good arc location, it is possible to significantly reduce contact sizes and costs. (See Photograph 4.)

In addition to this, work on simplifying design has permitted the halving of number of components required and significantly reduced manufacturing plant requirements. This has made the local manufacture of vacuum interrupters a viable proposition and proposals in this context are being prepared for board approval.

#### CONCLUSIONS

Vacuum Switchgear offers a strong package of advantages to the user and is enjoying increasing popularity on the local and world markets alike.

#### DR NICO BOTHA: PRESIDENT-ELECT

Mr President it is my privilege to thank Mr Speedy for his paper. To my mind it is an art to deliver a paper on a technical subject with ease, make it simple to understand, but still keep a high technical standard. I am of the opinion that all Engineers should always endeavour to make use of new improved technology where applicable.

The use of vacuum interrupters is part of improved technology and of new development. Therefore it should be viewed as part of mankind's achievements to use science to his own advantage. Vacuum is not completely new in South Africa, in fact several installations are presently in use. To my knowledge these switchgear perform satisfactory.

Although one might argue that vacuum or SF6 technology is

rather new and unproven if compared with oil circuit breakers, the majority of the circuit breakers on the 11 kV reticulation network of the City Council of Bloemfontein are all circuit breakers. However, lately quite a number of SF6 and vacuum breakers were installed at distribution centres and substations, this being necessitated by a very high fault level experienced. Especially where transformation is done directly from 132 kV to 11 kV. The symmetrical fault level at these substations in Bloemfontein varies between 18 and 22 kA when 230 MVA transformers are in parallel. To my mind vacuum circuit breakers satisfy these conditions very well.

Mnr Speedy het in sy referaat 'n verskeidenheid aspekte gedek, onder andere die metode van stroombreker, 'n lang vakuumbottel lewe, die betroubaarheid en die ekonomie. Hy noem in sy referaat dat die vakuumbottelonderbreker tipes 50 tot 100 keer die volle foutsroom kan hanteer voordat dit hoef vervang te word. Die vraag ontstaan egter; wanneer moet die vakuumbottel vervang word?, want hoe weet die instandhoudings ingenieur. Hoe groot was die foutsroom, hoe weet hy hoe lank het dit geduur, hoeveel keer is 'n foutsroom en hoeveel keer is dit 'n normale stroomonderbreking?

Normaalweg word die tipe van onderbreking, dit wil sê dit 'n foutsroom of 'n normale stroomonderbreking is, nie gemonitor nie. Let wel ek sê normaalweg, en ek wil graag vra dat Mnr Speedy hierop moet reageer. In die geval van oliestroombrekers kan die olie-inhoud dooieenvoudig getoets word en vervang word indien nodig. Dit blyk nie so eenvoudig te wees in die geval van 'n vakuumbottel nie.

Tydens navraag by GEC het die geblyk dat die vervanging van die vakuumbottels by byvoorbeeld die AGV stroombreker, maklik gedoen kon word. Ander reekse verg egter meer kundigheid veral met die opleining van die vakuumbottelonderbreker en moet liews na die GEC-werke gestuur word vir vervanging. In die geval van Bloemfontein kan die koste vir die vervanging van 'n enkele vakuumbottel ongeveer R2 000 beloop, so verstaan ek.

Mnr die President oliestroombrekers kom 'n lang pad saam met ons oor die jare het ons werklik min probleme gehad. Alhoewel baie gemaak word van die omtrent geen onderhoud op die vakuumbreker teenoor die hoë onderhoudskoste van stroombrekers, is ek van mening dat die lae onderhoud van die vakuumbottels oorbeklemtoon word. In die praktyk word werklik aan die oliegedeelte van 'n stroombreker deur die meeste van die Stad-srade, sou ek sê nie veel aandag geskenk nie, miskien is ek verkeerd as ek sê nie meer veel aandag geskenk nie. Andersins moet ek liewer sê ek dink die feit dat hulle sê daar is 'n gewelddige onderhoudskoste aan oliestroombrekers word weereens oorbeklemtoon.

Nieteenstaande mnr die President, dink ek mnr Speedy het 'n baie goeie referaat gelewer om weereens hierdie sake onder ons aandag te bring en ek dink ek moet mnr Speedy gelukwens met sy referaat wat andermaal die vooruitgang in die tegnologie onder ons aandag gebring het, en ek dank mnr Speedy daarvoor. Baie dankie.

#### MR GR MARSHALL: AFFILIATE

Mr President, switchgear over the years has presented a lot of interesting problems in its development. The technology is perhaps more closely associated with physics and arc technology than the normal fields of electrical engineering and it is interesting to note that whilst the steam turbine, generator, transformer and motor were all basically very well worked out at the turn of the century, that was not the case with switchgear. In fact switchgear was virtually unknown at the dawn of electric power supply.

When Charles Merz was designing his first power station in 1899 the best switchgear available was made by Ferranti. Looking at the slide, today we would call it an air disconnector rather than a circuit breaker. You can see it has two fixed contacts, a sort of boom between them that carried the current and a handle by which you seized the thing and opened it. History records that it was helpful for the operator to stand on an insulated platform.

The next slide represents an improvement, can you see those sort of steel black blades that are hooked under the fixed contacts. That was referred to as a snap-action and that helped to get the arc out. Now when you think of it, it was used to synchronise machines, bringing them into parallel and out again, and to control feeder circuits in 1900.

This switch was designed by Ferranti for his supplies in London, which was single phase and the difficulty of applying it to three phase will be obvious, particularly as a man only has two hands. To some extent this was overcome with a later development. We've still got the same arcing in air but a railway signalling type lever is being used to give the operator a bit more protection. We also see the appearance of some instruments to give him a bit more information about what was going on.

Merz and other realised that public supply could not be operated without fully rated switchgear and when Dunstan power station was started in 1906, Merz put his engineering staff, under Bernard Price, to design the switchgear. The changes wrought in the 6 years, I think are quite remarkable. You see the busbars in the chamber up in the roof, which are metal enclosed and the connections are led out through disconnectors on the wall into the circuit breakers and through the main floor down to either the outgoing cables circuit of the generator circuit, where we have the appearance of a VT for instrumentation and current transformers for protection. That sort of switch then allowed you to trip things remotely, automatically and introduce protection to power systems.

Looking a little bit more closely at the circuit breaker we see the connection into the floor there to an insulated bushing, into a steel cylinder which is half filled with air, and the moving contact is led out through the top of the cylinder through a porcelain insulating bush. In operation that circuit breaker generated an arc in the oil which caused a very sharp pressure rise in that cylinder, being a sealed container, and that high pressure caused the arc to extinguish and dielectric strength to be restored at current zero.

I was very interested to hear the remarks that were made about Boksburg's history, because when Bernard Price came out this Country to take over the Victoria Falls and Transvaal Power Company, and in writing the first specifications, called for circuit breakers to be fitted with an explosion pot, and that is what he meant. Some of that switchgear was 40 kV switchgear which went into Boksburg in about 1908.

At this time when the oil switches, which I've shown there was a lot of strong competition from very many other technologies and I would just like to run through those so that we can see the devices which have been strongly promoted but have passed away over the years.

What of the water circuit breaker, highly recommended because it was fireproof and water under arc liberates just as much hydrogen as oil and that of course was the way the current was conducted just before the arc goes out. The problem with this type of course was that it was impossible to keep the water in a sufficiently insulating or non-ionised state. Water in contact with any metal ionises itself and then electrolysis begins and you get hydrogen and oxygen coming off the top of the thing. So this disappeared off the scene fairly quickly.

This is an early development of the simple switch that I showed in the first slide. The contacts have been re-arranged and placed inside baffles. The idea being to cool the arc and help it extinguish at current zero. In the USA this particular development was followed and taken to quite advanced stages.

There is a typical airbreak switch at the end of its service life. In recent years this airbreak switch, I think has faded away completely. Nowadays all the attractions of it of high mechanical robustness, frequent switching duty can be achieved by vacuum and SF6 breakers and they are very much cheaper than the air-break switch today.

There was another switch that was tried in the 1920. It is a vacuum switch, that is to show us that nothing is really new. That device achieved about 1 or 2 kA, I think at 40 kV. From what Mr Speedy has told us today, I think you'll see that the contacts

were a little bit suspect and the need to have a vacuum pump at the top of it permanently, must have been a big disadvantage. So that was put out off and had to wait until the electronics vacuum tube told us a little bit more about vacuum enclosures.

In tracing the history of early breakers we can see why the oil breaker became dominant technology and has remained so for about 60 years. Today it is the well proven article as Dr Botha has said. It gives little trouble or cause for concern. However, its performance is limited by the oil, both as a conductor when dissociated and an insulator.

In contribution to Mr Speedy's paper, I want to highlight the matter of oil deterioration. In all medium voltage oil breakers the oil is in contact with air and the principal pollutant is moisture. It is also in contact with carbon particles which stems from the arc and also fibre particles which are given off by the materials used in a bulk and small oil volume breaker and fibre particles introduced during normal circuit breaker maintenance. Now these pollutants decrease the electric strength of the oil to an extent which is difficult to determine exactly.

I have prepared some graphs to show the problem and have taken my figures from a number of published papers. On this slide I am showing the relative impulse withstand strength of three oil companies. The curve at the top, curve A relates to refined oil of the type which one would put into a power transformer. It is generally higher performance oil than ordinary switch oil, and the characteristics there you see at the very short tail links, if I could perhaps describe that in more detail, the voltage stress here is a one micro second rise time impulse wave form with various tail lengths. The standard lightning impulse of course is 50 micro-seconds tail length.

In curve A we see a very high withstand for very short tail lengths and there is a drop until you reach about 20 micro-seconds or thereabouts. A fairly level plateau indicating that high quality oil is fairly insensitive to the tail length. In curve B we have a sample of oil which just complies with the requirements of SABS 555, the most important part of which is 35 parts per million water content and we see the form is the same except there is a much deeper slope for the tail region, plateau region, and that indicates that at the longer wave forms the oil breakdown is reducing and perhaps the more important thing would be to look at the switching surge withstand of that oil.

But curve C is the one that I really want to dwell on here and it deals with oil containing both water and fibre and the effect of the combination of water and fibre is that the two combine in the oil. The fibre tends to mop up the water and you have a conducting element floating around in the oil which tends to lodge itself in the regions of high electric strength in the breaker and then could under surge conditions precipitate a breakdown.

The manufacturer takes these effects into account in his design, but if one thinks back over the years to the number of times when a breaker has not been opened for some time and under lightning surges sparked over, or when the breaker has just been opened on a circuit with inductants and capacitors, typically with a cable circuit with the transformer remotely connected at the end, and a breakdown occurs. That is indicative of the surge properties of the oil having deteriorated to a dangerously low level.

Now just in passing I'd like to mention this turn-up. I think it is quite important to us because it indicates that oil-paper systems have a much higher dielectric strength for short tail wave forms and these are typical of the pre-strike transients that one gets in modern switchgear, so that there is in fact more in hand on normal insulation systems than one would suspect, basing it purely on the 150 micro-second wave form.

A more interesting thing is perhaps the withstand of oil under 50 Herz voltage stress, and the samples in this slide were prepared by treating ordinary oil to a level of about 20 kV per millimetre and then adding water to it and you'll see on the X axis there are various concentrations in parts per million, and then the voltage test was done in a cell which precluded contact with air. It is essential to do that to get a meaningful test out of this sort of experiment, because air itself enters the oil and reduces the withstand.



Typically again you have a rapid drop to about 10 kV per millimetre at 200 parts per million water in the oil, and 200 parts per million is not unusual in a circuit breaker that perhaps in a damp area hasn't been maintained for a couple of years. But if the water was just on its own, the 10 kV per millimetre will be perfectly satisfactory, but when it is combined with fibre particles, the Curve B results and a very much lower withstand level.

Curve B was obtained by mixing expanded polystyrene spheroids in the oil sample. These spheroids were a hundredth of a millimetre in diameter so it corresponds to a very small particle indeed and typical in fact of the arc produced carbon particles. Now in action the spheroids absorb the moisture and become conductors in the electric field and severely reduce the electric strength of that oil and on the graph values as low as 1 kV per millimetre are indicated, and at that sort of level an oil switch would be getting very close to failing on a 28 kV AC test.

Mr President there is no way around the oil deterioration problem other than by maintenance and since contact-and arc chamber erosion cannot be reduced further in an oil breaker design, it would appear that the oil switch must ultimately yield to newer technologies.

The vacuum breaker and switchgear, described by the author, should go a long way to reducing maintenance, giving better performance and I think it could be said that it is a major breakthrough in a field which has seen little change in 50 years.

#### MR FLU DANIEL: CAPE TOWN

Mr Speedy, compliments on setting out your vacuum switchgear in such a clear and lucid way.

In your paper you mentioned the reliability of vacuum bottles and unfortunately Cape Town, as you know, has resisted the use of vacuum switchgear for quite some time. The first venture into this being by a private company, using it for switching on the capacitor bank - and you say that it is ideal for controlling capacitors - and as Cape Town is known for its firsts, soon after commissioning this bank, the units failed. One of the bottles blew through, it was repaired and within three weeks the second bottle did exactly the same. Possibly you can give us some explanation of how this came about. It does not really enhance our feelings on the capabilities of vacuum switchgear.

The other aspect I would like to bring to your attention is maintenance on vacuum switchgear. The ability to withstand 50 to 100 full faults is acceptable but what precautions does one take to check this equipment through its life, to make sure that it is functioning properly. If a bottle fails the only backup you have is switchgear further down the line, which is very unreliable as far as I am concerned.

#### MR STRICKLAND: WESTERN CAPE REGIONAL SERVICES COUNCIL

Mr President, I would like to add my thanks to the previous speakers, for the very clear explanation that Mr Speedy has given us on vacuum circuit breakers.

I was particularly interested to see that they have apparently overcome the question of current chopping. I have always thought that killing an arc is preferable to making it commit suicide, and that they seemed to have accomplished.

The question I would like to ask: Mr Speedy indicated that this thing is independent of power factor and current levels within a wide range. Does that mean that it is independent of the recovery of voltage.

#### MR CHRIS MARAIS: PARYS

Mr President, Mr Daniels has confused me now. People have been talking a lot about vacuum circuit breakers. You know in the Free State we always try things out and I am not quite sure, but I think it was at Rustenburg at one of the technical meetings where these vacuum circuit breakers were first described, and I thought well it looks a jolly good idea to me. With the first opportunity we had 15 breakers in three substations, and all I can

say is that we have had very very little trouble with the pots themselves.

We had a little bit of trouble with the linkages of that particular type of breaker because, what actually happened was that, the linkages were a bit slow with the result that when you had a trip, it did not come out quick enough and then the coils broke down. But in any case that is the only trouble that we have had and I can assure you that there was one pot that was broken and that was due to the alignment of this particular pot in the enclosure itself. This was repaired and I can assure you that at Parys, and we have quite a number of switches there, we went use anything else but vacuum. Thank you very much.

#### MR THOMS: SARBS

Mr Speedy made a claim in his paper which puzzles me and perhaps he can enlarge a bit. He was talking about the copper shields being used within the bottle to ensure that the condensation of metal vapour took place on the copper. Now as far as I know, I can see no reason why the metal vapour should preferentially condense on the copper rather than on the porcelain, and I wondered if Mr Speedy could elaborate on that a bit please. Thank you.

#### MNR PIET BOTES: ROODEPOORT

Mnr die President ek wil saamstem met die spreker van Parys. Ons het ook nou al lankal vakuum stroombrekers wat ons in gebruik het. Daar is egter probleme wat ons ondervind, en dit is dat die vakuum is eintlik 'n nuwe tegniek is wat nou darem al 'n aantal jare in gebruik is. Maar ek dink dat die meganiese skakeling, of die meganiese werking van die oop en toemaak van brekers, heelwat probleme oplewer. Dit is te stadig en nou het hulle die uitklink spoel so beplan, omdat dit 'n vakuumbreker is en hy baie vinnig oopmaak, het hulle die spoel ook so gemaak, maar die spoel gee in. Jy moet versigtig wees wanneer jy vakuum gebruik dat u die aanpassing van die meganiese gedeelte en die stroomspoel, die uitklinkspoel en die toemaakspoel behoorlik ko-ördineer anders gaan u probleme kry. Ek het dit ondervind in Roodepoort. Dankie.

#### MR DC PALSER: HONORARY MEMBER

Mr President I don't want to get involved in the pros and cons of vacuum versus SF6. I accept that vacuum has improved over the years. I think SF6 has as well. One question I have for Mr Speedy though is the availability of the bottles. Where are they sourced from, several sources? Are they made locally? Is there any intention or consideration being given to local manufacture? I would be grateful for the comments on that point to. Thank you.

#### MR TREVOR GAUNT: AFFILIATE

A question to Mr Speedy. He indicated that the vacuum circuit breakers were very fast and one could use this to advantage to get better discrimination. He specifically said in his verbal presentation, but not in the paper, that the first phase to clear would be after 5 milli-seconds and the last phase to clear would be about 5 milli-seconds later.

I am not sure whether this is technically feasible and I would appreciate further clarification, both on the difference in time between first and last phase to clear, and what the time starting point is measured from. Thank you.

#### MR EG DAVIES: PIETERMARITZBURG

The problem I have with vacuum circuit breakers is the fact that when they first came out they did produce overvoltages. Now they have done a lot of redesigning since then and I think they have new contact material, but I am still not convinced in my own mind that the designs we are getting today don't produce those overvoltages.

I go out to tender and we get circuit breakers, but I am never sure what bottle I am going to get. It is imported I gather, and we might get substandard bottles. Now the gentlemen from Parys said that his circuit breakers had operated magnificently.



Well if they in fact produce overvoltages, he has probably had breakdowns on the system due to that. He would never know about it and the circuit breaker is deadright, but there are other side issues. I would welcome some comments whether Mr Speedy is absolutely sure at this point in time that he would produce a circuit breaker which has just as good overvoltage capabilities as SF6 or oil circuit breakers.

#### **PRESIDENT:**

Thank you Mr Davies. A question to Mr Speedy. Possibly he could tell us how many units they have in fact produced and sold since the first unit was sent out and what the percentage failure was and whether it was more initially and whether that has in fact diminished if there was failure. It looks as if there were some, and what the total number was you have in fact sold.

#### **MR GLYNN RILEY: AFFILIATE**

Mr President I wasn't going to ask any questions and I am not going to ask any questions that are biased towards the technology, you can gather I favour vacuum.

I think that we have to say is that in this Country, both the modern media and modern technologies are widely used and therefore acceptable and we wouldn't contend anything different to that. I think what I would like John to comment on is some of the questions that have raised with an important aspect for us and that is:

What is the history in the world, and we are very good triers out of things here. What do we see happening in the world generally? What do we see happening in Japan, in America, in Britain, in France - do we see any companies that have gone one route and changed to the other? What is happening and where we should be looking, gentlemen? Towards improved technologies, to insure that we can make the best of both the technologies we currently use and to squeeze the very best out of them for our Country and our users.

#### **RDL THEO BUYS: GERMISTON**

Mnr die President, dit skyn vir my die probleem lê in die sogenaamde bottels waarvan gepraat word en om dan die gedeeltelike vakuum te skep. Ons weet natuurlik almal 'n volkome vakuum is nie moontlik nie. Dit sal interessant wees om te weet tot watter mate die vervaardigers in staat is of watter graad van vakuum hulle kan skep. Maar ek sal wou aanbevel dat indien daar 'n probleem is met die bottel metode, moet ons tog maar kers gaan opsteek by die meganiese ingenieurs.

Die meganiese ingenieurs is al baie dekades besig met vakuum en gedeeltelike vakuum en om dit op 'n baie effektiewe manier te skep. As dit die probleem sou wees dan kan ons miskien by hulle kers gaan opsteek om die vakuum behoorlik in stand te hou op 'n baie effektiewe wyse. Dankie mnr die President.

#### **MNR PJ BOTES: ROODEPOORT**

Hier in Suid-Afrika het ons 'n beperkte mark, maar ons het reeds fabrieke wat die gewone oliestroombrekers vervaardig met die verskillende tegnieke daaraan verbonde, naamlik soos SF6.

En dan het ons vakuum. Behoort ons nie te kyk wat kan die mark bekostig in Suid-Afrika? Wat behoort ons in die land toe te laat, wat nie hier vervaardig word nie, sodat ons meer kan rasionaliseer in hierdie rigting. Is dit nie 'n aspek wat baie ernstige aandag moet geniet, dat ons as 'n klein land moet kyk waarheen gaan ons en op daardie rigting moet toespits eerder as om die hele wêreld se tegnieke in Suid-Afrika uit te probeer nie. Dankie mnr die President.

#### **MR JOHN SPEEDY: AFFILIATE**

In response to Dr Botha's questions. How do you know when you achieved your limit of your 50 to 100 fault operation limit. In actual fact obviously our communication must be a little poor, because we build and supply with vacuum circuit breakers, a special ruler gauge where one actually checks a specific gap. When this gap falls below a certain level then one knows

that the interrupter has reached the end of its life. Remember that this is a very slow process and we recommend every several years that one would actually check the wear and that will tell whether the bottle is approaching the end of its life.

The other aspect that needs to be watched is that we provide a mechanical counter on each circuit breaker and we impose a limit of 30 000 mechanical operations on the unit before overhaul is necessary. So I hope that answers that question. In practice, I believe that, very very few interrupters will actually be worn out during the service life of the equipment.

On the subject of replacing interrupters when this does become necessary I believe that there will be very very few cases when this does arise. The maintenance manual in fact very specifically indicates all operations that are necessary to replace an interrupter. However, it is such a rare requirement that it is probably unlikely that the user would generally be requiring the direct knowledge of how to do it. However we could very readily train somebody if it became a factor.

The other point that Dr Botha was making is that we are stressing the low maintenance aspect of the vacuum circuit breaker compared to oil too much. Basically what we are saying is that there is a significant reduction in maintenance in terms of having to change oil and check oil. However, one still has to, inspect the equipment on a regular basis. However, against that we are saying that there is no cost differential so that, this reduction in maintenance is not of great value. There is a considerable added safety in these new technology switchgears as compared to the oil. Far less fire risk and possibility of personal injury.

Coming to Mr Marshall's contribution, I think I am perhaps answering part of Mr Fortmann's question. Vacuum is not really so new. Certainly we were not the first to introduce in into South Africa and over the last eight years we have sold over 7 000 vacuum circuit breakers, so that there are quite a lot of circuit breakers in service in South Africa, including circuit breakers for use at 12 kV. We have supplied a large number of 25 kV single phase circuit breakers to the Railways for trackside substations. These are probably the earliest circuit breakers that we provided and to the very best of my knowledge they have given absolutely excellent service. So that is where our longest service experience has been gained.

The question raised by Mr Strickland on current chopping. Current chopping used to be a problem that inhibited the development of vacuum interrupters for many years as Mr Marshall pointed out. The very first interrupters were proposed way back in the 1900's and it was a long time before practical interrupters could be built. One of the reasons was that special contact materials had to be formulated that produced for very low levels of current chopping. This is however now totally understood and well under control.

The question raised by Mr Daniel about the reliability of vacuum bottles. I would very much like to look at the particular installation that he is referring to. I basically was involved, some years ago, in a story that sounded very similar. This vacuum switch was blowing up all the time. In fact it was an ore handling plant at Saldanha and what was actually happening was that resonance between a capacitor bank and transformer inductance was creating very high overvoltages on the system, which in fact in that case had nothing to do with the switching device. It had to be solved not by changing the switching device. So I would like to take a look and find out why these bottles are blowing, because it is certainly totally out of line with our overall experience that we would get consistent failure of vacuum bottles.

#### **MR MARTIN LACEY: AFFILIATE**

I think the bottles Mr Daniel is referring to are vacuum contactors and not vacuum circuit breakers.

#### **MR JOHN SPEEDY: AFFILIATE**

The instance that I referred to at Saldanha was in fact vacuum contactors and not vacuum circuit breakers and of course there is substantial difference between a vacuum contactor and a vacuum circuit breaker. I think I answered Mr Daniel's question as to when to do maintenance.

On the subject of bottle failure again, I think the key issue is that with this device the way it is made you very very seldom do really get interrupter failures. As I have mentioned we have supplied 20 000 and other than those that have been mechanically damaged and other early historical problems I don't know of any failure rate of vacuum bottles and that certainly would have come to my attention.

Another matter to remember is that a lot of capital is made by the opponents of alternate technologies as to what happens when a bottle fails. I think this comes more from propaganda than from actual failure of bottles. It must also be remembered that for example we are used to having very reliable containment of vacuum in all types of luminaires. We are quite happy to have television sets that are high vacuum devices. When it is a vacuum tube we say it is going to leak and I am not quite sure why.

I would like to look at Mr Marais' problem in Parys in some more detail to find out precisely what his mechanical problems are.

In answer to Mr Thoms, basically the metal vapour deposits in line of site and the shields are carefully placed to protect the areas that we want to protect, and that actually works. We can show him interrupters that have been subjected to arcing.

In answer to Mr Botes, Roodepoort, again mechanism coils - I'm not quite sure whether I can answer him on that one.

Mr Palser's question about the sources of bottles. At the moment we do have various sources of bottles but as I mentioned as part of my main address, we have been looking very seriously at local manufacture of vacuum bottles and developments that have taken place to make this a feasible proposition and it is something where we have gone a long way in putting a proposal to our Board. We believe that's quite a feasible proposition.

We would certainly investigate any claim of problems with over-voltages. We do not believe that it is a current problem and certainly not in distribution system equipment.

Basically looking at the world market we see the world has gone over to vacuum up to 12 kV. SF6 is not a new technology and in fact both were available at about the same time. Vacuum is moving ahead much faster than SF6 and if anything manufacturers are changing from SF6 to vacuum. So that is what the world picture tells us.

#### PRESIDENT:

Ladies and Gentlemen we have listened to a very interesting paper and to Mr John Speedy and all the contributors a hearty thank you.

## LASBESTUUR – WANNEER IS RIMPELBEHEER GEREGVERDIG?



Callie Coetzee

### 1. BESTEK

Hierdie referaat bied 'n riglyn om die gangbaarheid vir die implementering van 'n lasbeheerstelsel op 'n elektrisiteitsnetwerk te ondersoek. Alvorens die metode verder bespreek word, moet dit duidelik verstaan word dat hierdie referaat nie die aanwending van lasbepalers dek nie.

### 2. INLEIDING

Daar is verskeie faktore wat in 'n gangbaarheidstudie vir die aanwending van 'n lasbeheerstelsel in aanmerking geneem moet word. Voorbeelde hiervan is: Lasfaktor, daaglikse laspatrone, kapitaalkoste (delging en rente) en die grootte van die na-diversiteit beheerbare las. Dit is algemene praktyk om in plaaslike besture die warmwatertoestelle in woonhuise as lasbeheerlement aan te wend. Gevolglik is daar ook onmeetbare faktore soos verbruikerstevredenheid wat in aanmerking geneem moet word.

### 3. STUDIEMETODE

'n Ondersoek sal noodwendig op die heersende Evkom-tarif gebaseer moet word. Die besparing wat met behulp van 'n lasbeheerstelsel bewerkstellig kan word, sal teen die kapitale las afgespeel word. Indien die besparing groter is as die kapitaal- en bedryfskoste van die stelsel, is dit geregverdig om so 'n stelsel te installeer.

Die verskillende stappe in die studie is:

- 1) bepaling van die algehele netwerk-lasfaktor;
- 2) bepaling van die warmwatertoestellenasfaktor;
- 3) deur middel van 1) en 2) 'n realistiese verbetering in lasfaktor te bepaal;
- 4) deur m.b.v. bogenoemde 'n besparing in aankoopprys van elektriese energie te bereken; en
- 5) dit te vergelyk met die kapitaalkoste (delging en rente) van 'n lasbeheerstelsel.

As uitgangspunt word die aankoopkoste van elektriese energie in sent per kW.h as funksie van lasfaktor uitgedruk. Hieruit kan 'n verbruiker sy aankoopkoste (sent/kW.h) bepaal vir die gemiddelde lasfaktor van die netwerk voordat lasbeheer toegepas word. Die aankoopkoste (sent/kW.h) word dan vervolgens bereken vir die beoogde verbeterde lasfaktor nadat lasbeheer toegepas is. Hierdie verskil bedrag verteenwoordig die jaarlikse besparing deur dit met die totale jaarlikse energie (kW.h) verbruik te vermenigvuldig.

#### 3.1 Tarif

Die toepaslike Evkom-tarif vir die doel van hierdie studie is tarif A vir groot kragverbruikers waarvan die toevoerspanning laer as 66 000 volt is. In die oefening word aanvaar dat die totale energiegebruik dieselfde is met of sonder lasbeheer, maar dat die kW-hoogsaanvraag verminder word. Die aankoopkoste per eenheid van elektrisiteit kan wiskundig as volg gegee word:

$$A = (R67,07 + R15,65 \times kW = R0,02787 \times kW.h) \times 100/kW.h$$

waar A = aankoopkoste per eenheid (sent/kW.h)  
 kW = hoogsaanvraag  
 kW.h = eenheid aangekoop in maand  
 R67,07 = heffingskoste  
 R15,65 = hoogsaanvraagkoste vir kW-aanvraag  
 2,787c = eenheidskoste

Ons weet egter dat die maandelikse lasfaktor (LF):

$$LF = \frac{kW.h \times 100}{kW \times 730} \%$$

vir 'n gemiddelde maand van 730 ure.

Indien dit in-bogenoemde vergelyking vervang word:

$$A = (6707 + 1565 \times \text{kW.h} \times 100 + 2.787 \times \text{kW.h}) / \text{kW.h} \\ = \frac{6707}{\text{kW.h}} + \frac{214.384}{\text{LF}} + 2,787 \text{ sent/kW.h}$$

Vir 'n groot verbruiker is die term  $\frac{6707}{\text{kW.h}}$  weglaatbaar klein, dus

$$A = \frac{214.384}{\text{LF}} + 2,787 \text{ sent/kW.h}$$

In 'n tipiese plaaslike bestuur is die lasfaktor tussen 60% en 70% sodat

$$A_{60\%} = 6,360 \text{c/kW.h; en}$$

$$A_{70\%} = 5,850 \text{c/kW.h}$$

Fig. 1 toon die verband van aankoopkoste in sent/kW.h as funksie van lasfaktor.

### 3.2 Besparing en kapitaalkoste

Dit is dus duidelik dat 'n verbetering in lasfaktor vanaf 60% na 70% 'n besparing van 0,51c/kW.h teweegbring. Vir 'n maandelikse aankope van sê 20 000 000 kW.h verteenwoordig dit 'n bedrag van R102 087. Vir twaalf maande is dit R1 225 044. Normaalweg word lenings op die kapitaalprogram van plaaslike bestuure oor 'n tydperk van 15 jaar aangegaan. Die algemene rentekoers is 15% en 'n faktor van 0,17101 van die kapitale bedrag is dan die bedrag wat jaarliks aan die delging en rente betaal word. Uit bogenoemde voorbeeld kan 'n jaarlikse besparing van R1 225 044 'n projek van R1 225 044 + 0,17101 = R7 163 581 finansier.

Alternatief kan 'n lasbeheerstelsel, wat sê ongeveer R1 500 000 in kapitaaluitg benodig, oor 15 jaar finansier word. Die jaarlikse delging en rente sal dan R1 500 000 × 0,17101 = R256 515 beloop. Die besparing in hierdie voorbeeld van R1 225 044 minus die kapitaalkoste van R256 515 lewer dan 'n surplus van R968 529 (bedryfs- en instandhoudingskoste uitgesluit).

### 3.3 Laspatrone

Die daaglikse verbruikerskurwes is van uiterste belang in die gangbaarheidstudie. Hier word tussen twee patrone of laskurwes onderskei, naamlik die algehele netwerklasurve en die verbruikersurve van slegs die waterverwarmers. Die voornemende lasbeheerstelselgebruiker moet verseker weet dat die las wat deur middel van waterverwarmers afgewerk kan word wel 'n beduidende bydrae sal lewer op die tydstip van die algehele netwerk spitslas. Aangesien daar geen tydstip in enige dag is waar die termostate van alle warmwaterverhitters in die afgeskakelde posisie sal wees nie, is dit duidelik dat die beheerbare lasgrootte kleiner sal wees as die som van die afsonderlike waterverwarmers.

Uit gemete inligting is dit veilig om af te lei dat die verbruikspatroon van huishoudelike warmwaterverhitters vir alle plaaslike bestuure sal ooreenstem. Vervolgens word die bogenoemde laspatrone afsonderlik bespreek.

#### 3.3.1 Algehele netwerklasurve

Grootmaat elektrisiteitsverbruikers soos plaaslike bestuure, sal oor voldoende inligting beskik om daaglikse laskurwes op te stel. Hierdie kurwe verteenwoordig die algehele verbruikspatroon wat alle verbruikers insluit, hetsy handel, nywerheid of huishoudelik. Waar die oorwegende verbruik in 'n plaaslike bestuur huishoudelik is, sal daar prominente oggend- en laatmiddagspitslaste kenmerkend voorkom. Indien die oorwegende verbruik dié van die nywerheid is, sal 'n patroon voorkom waar die spitslas gedurende die dag, normaalweg tussen 08h00 en 17h00, voorkom. Uit hierdie lasurve kan die tydperk waarvoor lasbeheer toegepas behoort te word, geïdentifiseer word.

#### 3.3.2 Waterverhitterlasurve

Die huishoudelike waterverhitter is reeds as be-

heerbare element geïdentifiseer. Soos bekend, word waterverhitters termostaties as 'n funksie van watertemperatuur beheer. Huishoudelike verbruik plaas die grootste vraag na warm water gedurende die oggendure tussen 06h00 en 09h00 asook die laatmiddag/aandure tussen 17h00 en 22h00. Na aanleiding van die warmwaterverbruik is dit duidelik dat 'n wisselende persentasie van waterverhitters gedurende die dag beheerbaar is, dit wil sê gedurende die genoemde twee spitslastydperke sal hierdie persentasie groter wees as die persentasie om middernag of in die middel van die dag. Hierdie persentasie word die na-diversiteit beheerbare las genoem. Indien 'n plaaslike bestuur nie oor 'n lasbeheerstelsel beskik nie, is dit moeilik om 'n gemiddelde kW-grootte vir die waterverhitters in die gebied te bepaal. Verder is dit ook feitlik onmoontlik om 'n na-diversiteit beheerbare las vir elke uur van die dag te bepaal.

Met die vergunning van Evkom is 'n projek geleeds om in Roodepoort die totale waterverhitterlas te meet asook die beheerbare gedeelte daarvan. Die spesifieke metode as sulks sal nie bespreek word nie, maar die gemete waardes word vervolgens ontleed. Die geregistreerde hoogsaanvraag van Roodepoort is 142MW. Eerstens is bepaal dat die totale waterverhitterlas 73,4MW is. In Roodepoort is 30 470 waterverhitters. Die gemiddelde waterverhitter is dus van 2,4kW-vermoë.

Fig. 2 toon vir 'n kenmerkende weekdag die totale lasurve (dit wil sê sonder enige lasbeheer) en die lasurve met alle waterverhitters afgeskakel. Hierdie verskil verteenwoordig die beheerbare gedeelte van die waterverhitters.

Fig. 3 toon die kurwe vir die beheerbare waterverhitterlas as persentasie van die algehele netwerk las vir elke tydstip.

Fig. 4 toon die kurwe vir die beheerbare waterverhitterlas as persentasie van die totale waterverhitterlas. Hierdie kurwe dui duidelik aan wanneer die waterverhitterspitslaste voorkom.

Deur Fig. 1 met Fig. 4 te vergelyk, in die geval van Roodepoort, kan afgelei word dat die beheer van waterverhitters 'n merkwaardige invloed op die spitslaste in die oggend en laatmiddag kan uitoefen. Hierdie gegewens bevestig ook die feit dat 60% van die totale elektriese energie in Roodepoort deur huishoudelike verbruikers verbruik word.

## 4. TOEPASSING BY ANDER PLAASLIKE BESTURE

Figure 5 tot 12 toon verskillende laspatrone van ander plaaslike bestuure wat selfverduidelikend is. Hierdie kurwes word met vergunning van die Ingenieurs van Rustenburg, Queenstown en Kemptonpark geplaas. Wat wel ooreenstem uit die gegewens van hierdie drie plaaslike bestuure en dié van Roodepoort is die waterverhitterlaspatrone. In al vier gevalle is daar kenmerkende spitspeke gedurende 06h00 tot 09h00 en 17h00 tot 22h00. In die geval van Queenstown is die gemiddelde waterverhittervermoë van 3100 waterverhitters volgens die voorafgaande metode as 1,58kW bepaal. In die geval van Kemptonpark is die gemiddelde vermoë van 6 200 waterverhitters in 1978 as 3kW bepaal. In Rustenburg is die gemiddelde vermoë van 8 500 verhitters as 2,2kW bepaal (totaal = 19MW). In Roodepoort is die gemiddelde vermoë van 30 470 waterverhitters as 2,4kW bepaal. Die blyk ook uit bogenoemde gegewens dat daar gedurende die waterverhitterspitspeke tussen 40% en 50% van die totale aantal verhitters beheerbaar is. Dit totale waterverhitterlas by 'n plaaslike bestuur kan bereken word deur 'n gemiddelde vermoë van sê 2,3kW per verhitter te neem en dit te vermenigvuldig met die aantal verhitters. Die beheerbare las is dan ongeveer 40% tot 50% van hierdie totaal.

## 5. BEPALING VAN LASTEIKEN

Nadat 'n lasbeheerstelsel geïnstalleer is, is een van die belangrike bedryfsveranderlikes die bepaling van die maandelikse teikenaanvraag. 'n Belangrike oogmerk wat in gedagte gehou moet word is die tevreedenheid van huishoudelike verbruikers. Soos voorag bespreek, kan die na-diversiteit beheerbare las as basis gebruik word om die teikenaanvraag te bepaal. Dit is egter die praktiese onderverinding wat 'n deurslaggewende rol speel in die bepaling van 'n teiken. Verbruikers behoort nie verontvrië te word deur langdurige tydperke waar onvoldoende warm water beskikbaar is nie. Die geskiedenis van 'n stelsel kan aangewend word vir die bepaling van 'n teiken deur byvoorbeeld die jaarlikse groei in elektrisiteitsverbruik en seisoene in ag te neem. Hierdie onderwerp verg 'n diepgaande studie en kan gevolglik nie binne die bestek van hierdie referaat bespreek word nie.

## 6. IMPLEMENTERING VAN 'N LASBEHEERSTELSE

Indien 'n gangbaarheidsstudie die gunstige aanwending van 'n lasbeheerstelsel op 'n netwerk aandui, is daar 'n aantal belangrike faktore wat 'n voornemende lasbeheerbruiker in ag moet neem. Eerstens moet interne personeel opleiding ondergaan ten opsigte van installasie, bedryf en instandhouding van die stelsel. Lasbeheerbruikers moet ook verseker kan word van nasorgdiens en ondersteuning deur die verskaffer nadat die stelsel in bedryf gestel is.

Die installasie van die waterverhitterreël by woonhuise behoort deur betroubare persone gedoen te word. In Rooodepoort het gevalle voorgekom waar, onder 'n bonus aansporingstelsel, interne personeel slegs die reël se moniteer het sonder om enige elektriese verbindinge te maak. Ondervinding in Rooodepoort het aangetoon dat dit onprakties is om waterverhitters met 'n vermoede kleiner as 1,5kW te beheer. Hierdie verhitters het 'n relatiewe klein opgaarvolume en lei tot ontevreedenheid by verbruikers wanneer hierdie verhitters beheer word. Daar is ook gevalle gevind waar verhitters met 'n 2kW element en volume van 135 liter geïnstalleer is. Aangesien 'n 2kW element relatief lank neem om 235 liter water te verhit nadat al die warm water met koue water verplaas is, is lasbeheer hier ook onredelik teenoor die verbruiker. Wat ondervoerverhitting betref, word lasbeheer wel toegepas.

## 7. RESULTATE EN GEVOLGTREKKINGS

Die lasbeheerstelsel in Rooodepoort oefen beheer uit oor 9 lasbeheerkanale. Die gemete las van elke kanaal is:

Kanaal	15	9 MW
	16	10,2
	17	9,5
	18	6,8
	19	9,8
	20	5,7
	21	8,6
	22	5,9
	23	7,9
Total		73,4 MW

Op Dinsdag 28 April 1987 is die hoogsaanvraag bepaal vir die gevalle met en sonder lasbeheer. Hieruit is dit duidelik dat die laatmiddag/aandspits effens hoër is as die oggendspits. Dit dui op 'n kenmerkende huishoudelike verbruikspatroon. Gedurende die spitsperiodes is die beheerbare waterverhitterlas so hoog as 36MW. Dit verteenwoordig 49% van die totale waterverhitterlas van 73,4MW. Gedurende die maand waarin die eksperiment uitgevoer is, was die teiken 110MW. Op bogenoemde datum was 'n aanvraag van 118MW gemeet. Die besparing in aanvraagkoste op 'n toevoerspanning van laer as 66kV sou  $(118MW - 110MW) \times R15,65/kW = R125\ 200$  beloop. Indien hierdie besparing oor twaalf maande gehandhaaf word, sal dit R1 502 400 beloop. Alternatiewelik kan die besparing deur middel van die verbeterde lasfaktor bepaal word. Die lasfaktor gedurende die eksperiment is soos volg:

$$\begin{aligned} \text{sonder lasbeheer} &= \frac{1\ 932\ 400\ \text{kWh}}{118\ 000 \times 24\ \text{W.h}} \times 100 = 68,2\% \\ \text{met lasbeheer (teiken} &= 110\text{MW)} = \frac{1\ 932\ 400}{110\ 000 \times 24 \times 100} = \\ &= 73,2\% \end{aligned}$$

volgens die vergelyking

$$A = \frac{214\ 384}{LF} + 2,787\ \text{sent/kW.h}$$

$$\text{is } A\ 68,2\% = 5,929\ \text{sent/kW.h}$$

$$A\ 73,2\% = 5,716\ \text{sent/kW.h}$$

Besparing in aankoopkoste = 0,213 sent/kW.h

Rooodepoort verbruik ongeveer 600 000 000MW per jaar wat 'n besparing van R1 278 050 teen die verlaagde aankoopkoste verteenwoordig.

Die voorafgaande berekeninge is op een enkele eksperimentele dag gegrond. Dit verteenwoordig egter nie die ware besparing nie. Op 25 April 1987 is die Evkom-meterlesings gemeen en 'n nuwe teiken vir Meimaand van 110MW is ingestel. Aangesien 28 April 1987 die begin van 'n winterlesingsmaand is, behoort die lasfaktorverbetering nader aan die einde van Meimaand groter te word. Dit is veilig om af te lei dat die besparing in die geval van Rooodepoort ten minste R2 000 000 per jaar sal wees.

## 8. OPSOMMENDE RIGLYN

Vervolgens word 'n verkorte voorgestelde riglyn neergelê vir die gangbaarheidsstudie:

- bepaling van laskurwe;
- bereken totale waterverhitterlas deur totale aantal warmwaterverhitters te vermenigvuldig met 2,3kW;
- bereken beheerbare komponent daarvan as 40%;
- bepaal uit (i) 'n lasfaktor en uit (iii) 'n realistiese verbetering in lasfaktor;
- bereken die beoogde besparing uit die vergelyking

$$A = \frac{214\ 384}{LF} + 2,787\ \text{sent/kW.h}$$

deur A te bereken vir beide gevalle van lasfaktor (normale lasfaktor en verbeterde lasfaktor);

- neem besparing in sent/kW.h en vermenigvuldig dit met die totale eenhede per jaar aangekoop wat dan die jaarlikse besparing in aankoopkoste is.

## 9. ERKENNINGS

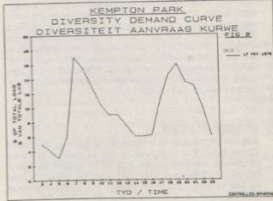
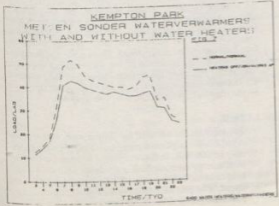
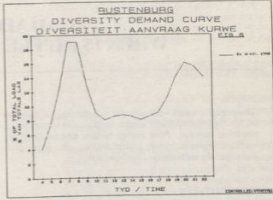
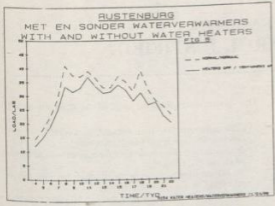
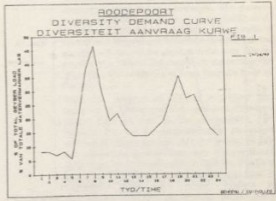
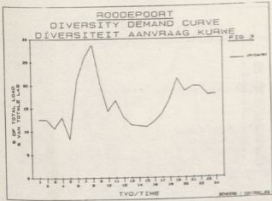
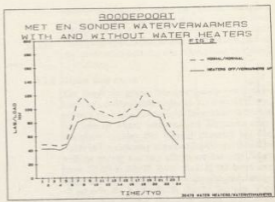
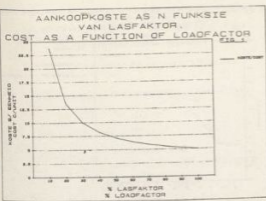
Dank: Aan Mnr Algera van Rustenburg, Mnr Malan van Kemptonpark en Mnr Perryer van Queenstown vir die gebruik van hul eksperimentele gegewens.

Aan EVKOM en veral mnr Stoffberg, vir die vergunning ten opsigte van aanvraagmeting gedurende die eksperiment in Rooodepoort.

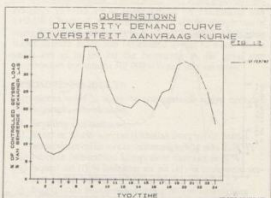
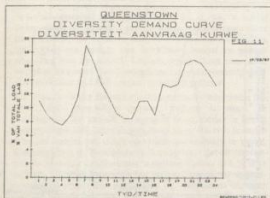
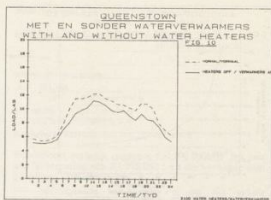
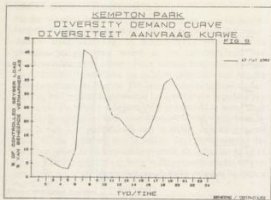
Aan mnr Farad vir hul inligting en ondersteuning.

Aan Mev Leygonie, Mnr Botes, Mnr Jooste, Schenk, Weenink, Greeff, Green, Greyling en De Koker, almal van die Elektrisiteitsdepartement van Rooodepoort, vir hul bydrae en hulp.

C J F COETZEE  
Adjunk Stadsingenieur (Elektrognies)  
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## LOAD MANAGEMENT – WHEN IS RIPPLE CONTROL JUSTIFIED?

### 1. SCOPE

This paper provides a directive for investigating the viability of the implementation of a load management system on an electrical network. Prior to any further discussion of the method it must be clearly understood that this paper does not cover the utilisation of load limiters.

### 2. INTRODUCTION

Various factors exist which must be taken into account if a feasibility study of the implementation of a load management system is to be conducted. Such factors are for example: Load factor, daily load patterns, capital costs (interest and redemption) and the extent of the after-diversity controllable load. In local government it is common practice to use the geysers in private residences as a load control element. Consequently there are also some factors like consumer satisfaction which cannot be measured objectively, but also have to be considered.

### 3. METHOD OF STUDY

Any investigation must, necessarily, be based on the current Escom tariff. The savings which may be realized by means of the load control system will be set off against the capital burden. If it is found that the savings should exceed the capital and working costs of the system, it is justified to install such system.

The various methodological steps of the study are as follows:

- 1) determination of the total network load curve;
- 2) determination of the geyser load curve;
- 3) determination of a realistic improvement in load factor by means of 1) and 2);
- 4) the calculation of savings on the purchase price of electrical energy by means of the above;
- 5) the comparison thereof with the capital costs (interest and redemption) of a load control system.

As a point of departure the purchase cost of electrical energy is expressed in cent per kWh as a function of load factor. Hence a consumer can determine his purchase cost (cent/kWh) for the average load factor of the network before load control is implemented. There-upon the purchase cost (cent/kWh) is calculated for the intended improved load factor following the implementation of load control. This balance represents the annual savings by multiplying it by the total annual energy (kWh) consumption.

#### 3.1 Tariff

The relevant Escom tariff for the purposes of this study is tariff A for large consumers with a supply voltage less than 66 000 volt. In this exercise it is assumed that the total energy consumption is the same with or without load control, but that the kW maximum demand is reduced. The purchase cost per unit of electricity can be indicated mathematically as follows:

$$A = (R67.07 + R15.65 \times kW = R0.02787 \times kW.h) \times 100/kW.h$$

where A = purchase cost per unit (cent/kW.h)  
 kW = maximum demand  
 kW.h = units purchased during month  
 R67.07 = levy cost  
 R15.65 = maximum demand cost for kW demand  
 2.787c = unit cost

We know, however, that the monthly load factor (LF) is:

$$LF = \frac{kW.h \times 100}{kW \times 730} \%$$

for an average month of 730 hours.

If it is substituted in the above equation:

$$A = (6707 + 1565 \times kW.h \times 100 + 2,787 \times kW.h)/kW.h$$

$$= \frac{6707}{kW.h} + \frac{214,384}{LF} + 2,787 \text{ cent/kW.h}$$

For a large consumer the term  $\frac{6707}{kW.h}$  is negligible and thus

$$A = \frac{214,384}{LF} + 2,787 \text{ cent/kW.h}$$

At a typical local authority the load factor is between 60% and 70% so that

$$A_{60\%} = 6,360 \text{c/kW.h; and}$$

$$A_{70\%} = 5,850 \text{c/kW.h}$$

Fig. 1 presents the relation of purchase cost in cent/kW.h as a function of load factor.

### 3.2 Saving and capital cost

It should be clear that an improvement in load factor from 60% to 70% will bring about a saving of 0.51c/kW.h. For monthly purchases of say 20 000 000 kW.h this represents an amount of R102 087 and for twelve months R1 255 044. Normally loans on the capital program of local authorities are negotiated for a period of 15 years. The general rate of interest is 15% and a factor of 0.17101 of the capital amount is then the annual amount payable for redemption and interest. According to the above example an annual saving of R1 225 044 can finance a project of R1 225 044  $\div$  0.17101 = R7 163 581.

Alternatively a load control system that needs about R1 500 000 in capital outlay, can be financed over 15 years. The annual redemption and interest will amount to R1 500 000  $\times$  0.17101 = R256 615. The saving in this example of R1 225 044 minus the capital cost of R256 615 produces a surplus of R968 529 (working and maintenance costs excluded).

### 3.3 Load patterns

The daily consumer curves are of the utmost importance in the feasibility study. Two patterns or load curves are distinguished, namely the total network load curve and the consumption curve of geysers only. The prospective user of a load control system must ascertain that the load which can be shed by means of geysers, will indeed make a significant contribution at the moment of total network peak load. Since there is no given moment in any day at which the thermostats of all geysers are in the switched-off position, it is obvious that the controllable load size will be smaller than the sum of the separate geysers.

From measured information it is safe to infer that the consumption pattern of domestic geysers is similar at all local authorities. The above-mentioned load patterns will subsequently be discussed separately.

#### 3.3.1 Total network load curve

Bulk electricity users like local authorities, will have sufficient information at their disposal to prepare daily load curves. This curve represents the total consumption pattern that includes all consumers, whether business, industrial or domestic. If a local authority has a predominantly domestic consumption, there will characteristically appear prominent morning and late after-

noon peak loads. If there is a predominantly industrial consumption, a pattern with a peak load during the day, normally between 08h00 and 17h00, will appear. From this load curve a period can be identified during which load control should be exercised.

#### 3.3.2 Geyser load curve

The domestic geyser has previously been identified as a controllable element. As is well known, geysers are being controlled thermostatically as a function of water temperature. Domestic consumption creates the biggest demand for hot water in the morning between 06h00 and 09h00 as well as during the late afternoon/evening hours from 17h00 to 22h00. As a result of the hot water consumption it is clear that a varying percentage of geysers are controllable during the day. This means that during the mentioned peak load periods this percentage will be larger than the percentage at noontime or at midnight. This percentage is called the after-diversity controllable load. If a local authority does not have a load control system at its disposal, it is difficult to establish the average kW-size of the geysers in the area. Furthermore it is almost impossible to determine the after-diversity controllable load for each hour of the day.

With the consent of Eskom a project was launched in Roodepoort to measure the total geyser load as well as the controllable part thereof. The precise methodological procedure will not be discussed and only the measured values will be discussed subsequently. The registered peak demand of Roodepoort is 142MW. Firstly it was determined that the total geyser load is 73.4MW. There are 30 470 geysers in Roodepoort and thus the average geyser has a 2.4kW capacity.

Fig. 2 indicates the total load curve (i.e. without any load control) and the load curve with all geysers switched off as for a typical week day. The difference represents the controllable part of the geysers.

Fig. 3 shows the curve for the controllable geyser load as a percentage of the total network load for each period.

Fig. 4 displays the curve for the controllable geyser load as a percentage of the total geyser load. This curve clearly indicates when the geyser peak load occurs.

By comparing Fig. 1 with Fig. 4 it can be concluded, in the case of Roodepoort, that the control of geysers can exert a remarkable influence on the peak loads during the morning and evening. These data also confirm the fact that 60% of the total electrical energy in Roodepoort is consumed by domestic consumers.

## 4. APPLICATION BY OTHER LOCAL AUTHORITIES

Figures 5 to 12 display different self-explanatory load patterns of other local authorities. These curves are placed with the kind permission of the Engineers of Rustenburg, Queenstown and Kempton Park. Data regarding the geyser load pattern are consistent for these three local authorities and Roodepoort. In all four cases there are characteristic peaks during the periods of 06h00 to 09h00 and 17h00 to 22h00. In the case of Queenstown the average capacity of 3100 geysers was calculated at 1,58kW by means of the foregoing method.

In Kempton Park the average capacity of 6 200 geysers was determined during 1978 as 3k.W. In Rustenburg the average capacity of 8 500 geysers was 2,2kW (total = 19kW) and in Roodepoort the average capacity of 30 470 geysers was

calculated as 2,4kW. The above details furthermore indicate that between 40% and 50% of the total number of geysers are controllable during geyser peak periods. The total geyser load for a local authority can be calculated by taking an average capacity of say 2,3kW per geyser and multiplying it with the total number of geysers. The controllable load is then approximately 40% to 50% of this total.

#### 5. DETERMINATION OF LOAD TARGET

Subsequent to the installation of a load control system one of the important operating variables is the determination of the monthly target demand. An important objective to be kept in mind is the satisfaction of domestic consumers. As previously discussed the after-diversity controllable load can be used as basis to determine the target demand. It is, however, practical experience which will play the decisive role in the determination of the target. Consumers should not be inconvenienced by extended periods during which insufficient hot water is available. The history of a system can be utilised to establish a target by taking into account such factors as the annual growth in electricity consumption and the prevailing seasons. This topic does, however, demand an in-depth study and can therefore not be discussed within the scope of this paper.

#### 6. IMPLEMENTATION OF A LOAD CONTROL SYSTEM

In the event of feasibility study indicating that a load control system may be utilised advantageously, there are a number of important factors to be observed by the would-be, user. Initially internal personnel must be trained in the installation, operation and maintenance of the system. Load control users must furthermore be assured of after-sale service and the support of the supplier subsequent to the commissioning of the system.

The installation of geyser relays at private residences should be performed by reliable persons. In Roodepoort it was found in some cases that internal personnel, under a bonus incentive programme, had installed the geyser relays without making any electrical connections. Experience in Roodepoort has suggested that it is impractical to control geysers with a capacity less than 1,5kW. These geysers have a relatively small storage volume and their control leads to consumer dissatisfaction. In some cases it was also found that geysers with a 2kW element and a volume of 235 litre were installed. Since a 2kW element needs a relatively long time to heat 235 litres of water after all the hot water has been displaced by cold water, load control in this case would be somewhat unfair to such a consumer. With regard to underfloor heating load control is applied.

#### 7. RESULTS AND CONCLUSIONS

In Roodepoort the load management system controls nine load control channels. The measured load of each channel is:

Channel	15	9 MW
	16	10,2
	17	9,5
	18	6,8
	19	9,8
	20	5,7
	21	8,6
	22	5,9
	23	7,9
Total		73,4MW

On Tuesday 28 April 1987 the maximum demand was determined for conditions with and without load control. Hence it is clear that the late afternoon/evening peak is somewhat higher than the morning peak. This suggests a characteristically domestic consumption pattern. During the peak load periods the controllable geyser load is as high as 36MW. This represents 49% of the total geyser load of 73,4MW. During the month in which the experiment was conducted, the target was 110MW. On the above-mentioned date a demand of 118MW was measured. The saving in demand cost

on a supply voltage of less than 66kV would have amounted to  $(118\text{MW} - 110\text{MW}) \times (R15,65)\text{kW} = R125\ 200$ . If this saving is maintained for twelve months, it will amount to R1 502 400. Alternatively the saving can be determined by means of the improved load factor. The load factor during the experiment was as follows:

$$\begin{aligned} \text{without load control} &= \frac{1\ 932\ 400\ \text{kWh}}{118\ 000 \times 24\ \text{h}} \times 100 = 68,2\% \\ \text{with load control (target} &= 110\text{MW)} &= \frac{1\ 932\ 400}{110\ 000 \times 24 \times 100} = 73,2\% \end{aligned}$$

according to the equation

$$A = \frac{214\ 384}{LF} + 2,787\ \text{cent/kWh}$$

A 68,2% = 5,929 cent/kWh  
A 73,2% = 5,716 cent/kWh  
Saving in purchase cost = 0,213 cent/kWh

Roodepoort consumes approximately 600MW annually and at the lower purchase cost the saving would amount to R1 278 050.

The foregoing calculations are based on one single experimental day. This does, however, not represent the true saving. On 25 April 1987 the Escom meter readings were taken and a new target of 110MW was fixed for the month of May. Since 28 April 1987 is the beginning of a winter month, the load factor improvement should be bigger towards the end of May. It is thus safe to conclude that the annual saving for Roodepoort is at least R2 000 000.

#### 8. SUMMARY GUIDE LINE

Next a summarized recommended guide line for the feasibility study is presented.

- determination of load curve;
- calculate total geyser load by multiplying total number by 2,3kW;
- calculate the controllable component thereof as 40%;
- determine out of (i) a load factor and out of (iii) a realistic improvement in load factor;
- calculate the envisaged saving out of the equation

$$A = \frac{214\ 384}{LF} + 2,787\ \text{cent/kWh}$$

by computing A for both cases of load factor (normal load factor and improved load factor);

- take saving in cent/kWh and multiply it by the total units purchased per annum, which then is the annual saving in purchase cost.

#### 9. ACKNOWLEDGEMENTS

Thanks to: Mr Algeria of Rustenburg, Mr Malan of Kempton Park and Mr Perryer of Queenstown for making available their experimental data.

To Escom and specifically to Mr Stofberg for their kind permission regarding the demand metering during the experiment in Roodepoort.

To Messrs Farad for their information and support.

To Mrs Lygonie and Messrs Botes, Jooste, Schenk, Weenink, Greeff, Green, Greyling and De Koker, all from the Electricity Department of Roodepoort, for their contributions and help.

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Deputy City Engineer (Electrotechnical)  
Roodepoort

# LOAD MANAGEMENT – WHEN IS LOAD CONTROL JUSTIFIED?

by PJ Botes



Piet Botes

Mr President, Honoured Guests, Ladies and Gentlemen my colleague and I decided that I shall deliver my part of the address in English and he will do his in Afrikaans. Mr President we have had numerous excuses in the past by Afrikaans speaking members, explaining that they can only deliver their talk in English as the Afrikaans technical terms are difficult to master and in some instances non-existent. Kindly therefore, Mr President, ladies and gentlemen enjoy his talk in Afrikaans.

My contribution is a small one in that I would like to give some advice to prospective users of load control equipment, on how to go about the whole process from decision-making down to after-installation maintenance.

Today it is not surprising to learn that communication processes and problems occupy an ever increasing part of the activities engaged in by members of an organization. It is estimated that a manager spends 80% or more of his working day solely communicating. This trend is unlikely to reverse as more and more of the resources and energies of an organization are being devoted to communication activities such as seeking information, reading, attending committee meetings, listening to talks, maintaining personal contacts inside and outside the organization, writing and "pushing papers".

Communication can be defined as being effective when the stimulus as it was initiated and intended by the sender, corresponds closely with the stimulus as it is perceived and responded to by the receiver. This may sound simple enough, but as we all know this process is not always being achieved that easily. In management the process of getting all the work routines of different sections and departments to move along together smoothly calls for the highest order of decision-making, programming, controlling and reappraising. These activities depend heavily on communication, and as levels of specialization among organization members increase due to the organization's growth in size, complexity and sophistication, the role of communication will become more critical. In a generally hostile economic environment, effective internal and external communication is essential to an organization's survival and the tolerable errors of yesterday are totally unacceptable today.

Therefore, having said all this, Mr President, ladies and gentlemen a few hints on how to go about when planning to install load control of geysers in your town or city.

1. It is essential that you do an honest appraisal of the installation along the lines as my colleague will elaborate in his paper.
2. Most essential is the creation of a well conceived and professionally conducted presentation. The utilisation of audio-visual material is highly recommended. Such presentations are usually well-received and the material can be kept for future presentation to other interested parties. The costs of such a presentation is negligible in relation to the ultimate cost of the scheme.
3. The whole concept, including the cost factors, must be conveyed first of all to all your staff right down to the apprentices even. They must be educated in the why's, whens, whereof and hows of the scheme. It can be most embarrassing if one of your staff members who is not conversant with the operation of a load control system, advises some of the customers that this scheme is again a whim of the electrical engineer, that it is a sheer waste of time and money and that the scheme will in any case not work. Such a situation may sound far fetched, however, it may arise unless your staff is well-educated.
4. A detailed and honest presentation must be made to your town clerk and colleagues, (i.e. other heads of departments). Their full co-operation is necessary.
5. You must make a presentation to your councillors, pointing out the problems which they will encounter when people complain. They must be taught as much as possible about the workings of the load control and the savings to the Council. This they can consequently convey to their constituents.
6. Through the media, by means of brochures and at ratepayers' meetings, the consumers must be informed about the scheme pointing out the benefits as well as possible inconvenience and how the inconveniences can be overcome and what assistance can be had from the municipality or council.
7. In the adjudication process an important consideration is the reliability and the failure rate of relays. This can be a very great maintenance cost and nuisance factor. People do not tolerate inconveniences.
8. Before installation the householder must be informed of the impending installation process and when the installer arrives on the premises a well-phrased letter must be handed to the householder, covering the installation aspects and future maintenance aspects, as well as the names and telephone numbers of your staff designated to the task.
9. Request all the electrical contractors to refer all complaints regarding geysers to the electrical department for investigation first. Provide prompt service, and advise the householder on the cause of the failure whether it was rectified by the Council or whether he should employ a private contractor.
10. Staff must be made available to test the installation if any complaint is received. They must ascertain the temperature setting of the geyser, whether or not the element of the geyser is operative and information must be obtained of how many people are resident in the household. This must be well documented and kept for future use. Immediate action after a complaint is absolutely essential.
11. Regular reports on the problems and savings of the system must be submitted to your council. Councillors normally not inherited in statistics pertaining to electricity but only on the quantity of speed cops and how much they can scrounge from electricity income to pay for these honoured men, in working down her we were heavily fined for exceeding the speed limit.
12. You must educate your staff in the operation of the system,

which includes forecasting of the targets, gathering and interpreting statistics and communicating with your consumers, advising them how to cope with their problems. A well-organised central control and complaints office is advisable.

Recently I experienced an unprecedented occurrence, when after regular maintenance was carried out at a specific station, the staff forgot to put the supervisory system on "remote". The streetlights in the area covered by the station did not come on and after locating the problem it was decided, to disconnect all the other stations from the central controlling unit before only the station in question was brought back to normal. Thereafter all stations were switched back. The central commanding computer, however, sensed the small amount of power restored and consequently decided to restore all the channels when the system was running at 140 MW with almost all channels in the "switched off" position. When the peak instant demand reached 185 MW the electrical system could cope no longer, causing disruptions which took hours to restore.

You may well ask whether the installation of a load control system is worthwhile, if you have to go to all this exercise. However, a system of this nature very closely involves the electrical staff, councillors and consumers and a very clear understanding of the functioning and problems of a load control system of geysers is absolutely essential. You may decide to leave this mark out as it seems to be a laborious task, but I assure you it works.

Apart from the pleasure derived in saving quite a substantial amount from the monthly bill, there are further benefits, such as:-

- (a) an "off peak" tariff structure whereby the maximum demand metering is only brought into operation when the load control of geysers is in operation;
- (b) be able to cut a substantial load when required in "power cuts" as we have been subjected to by ESCOM a few years ago, or when transmission problems are experienced. Once I was able to cut  $\pm 40$  MW while ESCOM was repairing one of the main feeders to Roodepoort;
- (c) in the restoration of power the geyser load can be disconnected and restored at leisure, making it easy to restore supply to areas where a discontinuation of supply occurred.
- (d) The control of all your streetlights by means of the load control relays, afford flexibility and also obviate maintenance of light sensitive cells and time controllers. The maintenance associated with a load control relay is far less than the maintenance of any of the aforementioned controllers.

Thank you very much Mr President, ladies and gentlemen for listening to me and my thanks to the City Council of Roodepoort and the staff of the Electricity Department Roodepoort for allowing and assisting me respectively to present this paper which I trust will give you food for thought.

Thank you Mr President.

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## "LASBEHEER – WANNEER IS RIMPELBEHEER GEREGERD"

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### MNR CALLIE COETZEE:

Mnr die President, dames en here, eerstens gaan ek aanneem dat almal die formele referaat gelees het, so ek gaan nie by die formaat van die referaat hou nie. U weet Salomo het gesê 'n mens mag nie onregverdig wins maak nie, en die Elektrotegniese Ingenieur is baie bewus van hierdie fyn beginsel en daarom sal ons as Elektrotegniese Ingenieurs nie poeg om groter winste te maak nie, maar om groter besparings te bewerkstellig.

Ons kyk natuurlik na 'n besparing in aankoopkoste, dit is die oogmerk van 'n lasbeheerstelsel en ons speel dit af teen die kapitaalkoste wat ons moet aangaan om so 'n beheerstelsel te implimenter. Die onderliggende onderwerp hier is om 'n besparing, of 'n verhoging te bewerkstellig in lasfaktor. Met ander woorde, ons wil die aankoopkoste van elektriese energie uitgedruk in sent tot die eenheid, sent per kilowatt uur, wil ons verbeter.

Ek wil net vinnig na die metode kyk wat ons gevolg het hom resultate te kry. Ons het natuurlik 'n stelsel wat reeds werk, so ook 'n paar ander Stadsrade, en deur van hierdie resultate gebruik te maak kan 'n mens terugwaarts gaan en vir ander Stadsrade wat nog nie 'n stelsel het nie, 'n riglyn gee om voorwaarts te kyk na 'n potensiele besparing.

Hier is 'n paar veranderlikes wat 'n mens in gedagte moet hou. Eerstens moet 'n mens, in jou dorp bepaal wat is die gemiddelde waterverwarmer se las in kilowatt. Met ander woorde, wat is die gemiddelde kilowattaanslag van elke waterverwarmer, deur die totaal te neem en te kyk na die totale aanvraag van al die waterverwarmers. Soos ek gesê het, die aantal, die totale waterverwarmlas is ook 'n veranderlike wat ons moet ken. Die derde veranderlike wat ons moet ken is die beheerbare komponent van die totale waterverwarmlas.

U weet daar is 'n wet in die Wiskunde wat sê as jy 'n stelling korrek kan bewys, of geldig kan bewys vir een geval en jy kan dit korrek bewys vir die tweede geval en jy kan dit ook 'n derde keer korrek bewys vir die geval en plus een, dan sal dit altyd

geld. Nou goed ons het dit nie streng toegepas nie, maar ons het 'n bietjie gekyk na Roodepoort se eienskappe, Rustenburg, Kempton Park en Queenstown.

Die belangrike aspek is om 'n formule te bepaal waarin jou lasfaktor verskyn, en waarin die lasfaktor die rol van die besparing kan deurgee. Daardie formule bevat ook inherent die Evkom tarief en soos Mnr Rothman ons belowe het, sal daar verhogings wees en hoe groter die Evkom tarief hoe groter gaan ons besparing wees indien ons lasbeheerstelsel het.

Daar sien u die uitdrukking. 'A' is die aankoopkoste en die lasfaktor kom prominent daarin voor en vir hierdie spesifieke geval was die aankoopkoste vir 'n lasfaktor van 60%, 6,36 sent per eenheid en die aankoopkoste vir 'n lasfaktor van 70%, 5,85 sent per eenheid. Dit is 'n besparing van 'n rasie oor die 0,5 sent per eenheid indien ons, ons lasfaktor met 10% kan verhoog.

Die kurwe en aankoopkoste en lasfaktor lyk soos volg. Aanvanklik is daar 'n vinnige verlagings in aankoopkoste vir die verhoging van lasfaktor. Later plat die kurwe af.

Ek wil net vinnig na 'n paar skyfies kyk. Hier is gegewens vir Roodepoort vir 'n tipiese dag, die spitslaspatroon, en u kan sien Roodepoort se spitslas in die namiddag is hoër as in die oggend. Hou dit net in gedagte, dit spitslas in die aand is effens hoër as in die oggend. Die boonste kurwe is vir die totale netwerk sonder lasbeheer. Die onderste kurwe is die kurwe vir al die waterverwarmers afgeskakel.

Vervolgens kyk ons na die na-diversiteit aanvraagkurwe en dan sien ons dat die persentasie waterverwarmlas in verhouding met die totale netwerklas soos volg daaruitsien, en dan kan u sien dat die prominente waterverwarmlaanaanvraag nie in die aand is nie, maar in die oggend.

Die volgende grafiek toon die persentasie beheerbare waterverwarmlas in verhouding tot die totale waterverwarmlas. In Roodepoort het ons gesien dat ons met veiligheid kan aanneem dat 40% van jou totale waterverhitterlas, wat in ons geval 73



megawatt is, beheerbaar is. Weereens is die grootste deel beheerbaar in die oggend. Let op dat van elfuur tot vyfuur in die middag het 'n mens nie 'n groot komponent om te beheer nie.

Vervolgens kyk ons na soortgelyke inligting van Rustenburg en Kempton Park. Hierdie inligting geld natuurlik voordat die Isando toevoer deur Kempton Park oorgeneem is. U sal het dat die spits prominent in dieselfde tye voorkom. Met ander woorde die huishoudelike verbruikers vul almal dieselfde verbruikerspatroon. In die geval van Queenstown is dit ook weereens dieselfde vorm.

Hieruit kan 'n paar gevolgtrekkings gemaak word en die belangrikste is - Wanneer 'n Stadsraad of 'n Plaaslike Bestuur kyk na lasbeheer, moet hy verseker word dat die komponent wat hy wil beheer, ooreenstem met die spitslastyd van die netwerk. Met ander woorde indien u 'n industriële las het, waarvan die spits ongeveer twaalfuur in die dag voorkom aan het u nie 'n goeie kans om goeie beheer toe te pas deur in die middag twaalfuur of eenuur lasbeheer deurmiddel van waterverwarmers te doen nie.

Hier is 'n paar resultate wat algemeen geldig was vir die studies by die verskillende Stadsrade, en die eerste een was dat die gemiddelde waterverwarmerlas 2,4 kilowatt is. Daar is beslis 'n neiging om al hoe groter waterverwarmers in huise te installeer met drie en vier kilowatt eenhede.

In Roodepoort te geval, was die totale werklik gemete waterverwarmerlas 73,4 megawatt. Die beheerbare komponent gedurende spitsytpe was 36 megawatt. In Roodepoort se geval was 49% of bykans 50%, van die totale waterverwarmerlas in spitsytpe beheerbaar, en dit is baie belangrik dat ons dit onthou.

Gevolgtrek het ons ook die ander Stadsrade se inligting geneem en gesien dat u met groot sekuriteit kan aanvaar dat 40% van al die geïnstalleerde verwarmers is spitsytpe beheer kan word. In paragraaf 3.2 van die referaat sien u watter soort van besparings ons kan verwag. Indien die lasfaktor kan verbeter vanaf 60 na 70% en die maandelikse aankope van energie is 20 miljoen eenhede, dan sal u oor 12 maande 'n direkte besparing in aankoopkoste van R1,25 miljoen kan bewerkstellig.

Die R1,25 miljoen kan aansewend word om 'n stelsel in sy geheel aan te koop. En soos daar uitgewys word in paragraaf 3.2 kan 'n projek oor 15 jaar met 'n kapitaalkoste van R7,16 miljoen finansier word. Of as alternatief kan u kyk na 'n besparing in die gemiddelde aankoopkoste van 'n lasbeheerstelsel. Ons gebruik rimpelbeheer met injeksie stelle by spanningsverlagingssubstansies van ongeveer R1,5 miljoen se kapitaalkoste en 'n lening oor 15 jaar. Die jaarlikse delging en rente afgetrek lewer 'n jaarlikse besparing van ongeveer R1 miljoen.

Opsommenderwys wil ek net gou kyk na die prosedure wat u behoort te volg. Eerstens moet u die laskurwe bepaal en meeste Stadsrade ken hulle laskurwe. Dan bereken u die totale waterverhitterlas deur die totale aantal waterverwarmers, te vermenigvuldig met 'n gemiddelde syfer van 2,3 kilowatt. Dit is bepaal deur metings by 'n paar Stadsrade. U bereken dan die beheerbare komponent wat 40% in hierdie twee lasfaktore word in die aankoopkosteformulege plaas en die besparing in terme van sent per eenheid word bereken en deur te kyk na die besparings in sent per eenheid en dit te vermenigvuldig met die jaarlikse aankope energie kan u die jaarlikse besparing bereken.

## MNR JG MALAN: KEMPTON PARK

Meneer die President, die outeurs moet gelukkigwens word met die daarstelling van 'n uiters werkbare dokument wat ek glo vir menige voornemende lasbeheergebruiker van groot waarde sal wees.

Mnr Coetzee het aangedui dat die tariefformule verwerk kan word na lasfaktor en deur 'n eenvoudige berekening te doen kan die jaarlikse besparing teoreties verkry word.

Mnr die President, dit moet 'n fees wees om oor die 30 000 beheerbare waterverwarmers tot jou beskikking te hê. In Kempton Park het ons tans 13 700 ontvangers met nog 10 000 wonings wat toegevoeg moet word.



Mnr Jan Malan: Elektrotegniese Stadsingenieur, Kempton Park, lewer sy bydrae tot die referaat.

Figure 1 gee 'n beeld van verskillende laspatrone, naamlik Kurwe A is 'n mengsel van al die soorte verbruikers maar bevat die 60% huishoudelike komponent waarvan ongeveer 57% tans beheerbaar is. Op hierdie spesifieke dag (14.07.87) was geen beheer toegepas nie. Kurwe B is 'n suiver nywerheidslas, volkome onbeheerbaar. Kurwe C is 'n enkele nywerheidsverbruiker, volkome beheerbaar deur die verbruiker self. Kurwe D is die vektoriese som en is die basis van die ESKOM-rekening.

Figure 2, 'n week later, (21.07.87) met die kwik op 1,9° C benede vriespunt, toon dieselfde laskurwes maar met kurwe A onder maksimum beheer en kan gesien word dat 16 000 kVA oor die oggendspits gesny word, d.i. 1,16 kVA per waterverwarmer. Dit gee 'n verbetering in die daaglikse lasfaktor van 7%, vanaf 76% na 83%. Indien dit herlei word na 'n volle maand, is die verbetering in die maandelikse lasfaktor 5% en teen R14,53/kVA verteenwoordig 'n vermindering van 16 000 kVA 'n besparing van R232 000/maand. Indien nie berekening gemaak word volgens die lasfaktorformule soos deur mnr Coetzee voorgestel, dan is die besparing ongeveer R231 000.

Dit is belangrik om in hierdie berekening die maandelikse lasfaktor te gebruik omdat laspatrone oor naweke aansienlik afwyk van die van weksdae.

Now if we consider the uncontrolled Curve A in Figure 1, which represents a 60/20/20% domestic/industrial/commercial consumer mix, and if we accept that this is a fairly representative mix in the average metropolitan local authority, and if we further accept that the higher the domestic contribution to the load the more dramatic the morning and evening peaks will be, then we should agree that most municipal load curves should be controllable.

Furthermore mr President, if you should superimpose a substantial industrial load such as Curve B in Figure 1 which predominantly peaks between 09h00 and 16h00, we still find that the aggregate results in a huge controllable peak in the morning such as curve D in Figure 1.

If this is the case and you should cut that morning peak, then you are not only doing yourself a favour, but you are indeed contributing to solving some of the problems in the national economy as this is the time when the ESKOM national grid peaks.

Mr President, I'd like to make another point and that is the scale of the demand curve. In the extreme case I want to refer you to Curve C in Figure 2 which we will agree is a curve which does not lend itself to any form of control. In fact this is a 96% load factor curve and in this mode nobody will spend money to try and straighten it any further. But if you would blow it up as was done in Figure 3 then we may agree that something can be done about it, and I want to assure you that with modern technology you can get that LF up to 99%, leaving only one percent for Mr Murphy's activities! I mention this case study specifically to demonstrate that even in the extreme case load control is feasible.

Mnr die President, om op te som en om die vraag wat u stel te beantwoord, naamlik "Wanneer is rimpelbeheer geregtig",



wat heelwat verdere navorsing regverdig.

Alternatiewelik is die potensiele besparing per gebruiker

$$= 2,3 \text{ kW} \times 0,45 \times 0,5 \times \text{R}15 \times 12$$

$$= \text{R}93 \text{ per jaar}$$

$$= \text{R}1\,397 \text{ oor die waarsynlike lewe van die geiser van 15 jaar}$$

wat myns insiens een of ander vorm van finansiële aansporing deur die plaaslike owerheid regverdig.

(iii) Die waterverwarmer spitsaanvraag is 'n funksie van die:

- grootte;
- konfigurasie (horisontaal of vertikaal);
- isolasie;
- grootte van element;
- kontrolestelsel, veral die dooie band tussen aan- en afskakeling;
- watertemperatuur;
- volume water verbruik wat weer 'n funksie van waterdruk, geïnstalleerde toebehore, gesinsgrootte, inkomste, ens is;
- waterverbruikspatroon.

Van hierdie veranderlikes kan met vrag in diepte ondersoek word om spitsvragte te verminder, byvoorbeeld:

- die opgaar van meer energie (groter waterverwarmer of hoër opgaartemperatuur);
- kleiner element;
- kontrolestelsel wat met die hand aangeskakel en termostaties afgeskakel word, soos die gebruik in Israel is;
- termostaat in die middel van die tenk.

Hier kan met vrag van matematisiese simulasietegnieke gebruik gemaak word om verskeie alternatiewe te ontleed, nadat 'n hoeveelheid werklike waterverbruiksdata op terrein ingesamel is.

(iv) Die reaksie van die verbruiker moet wetenskaplik bepaal word, verkieslik deur aan hom die keuse te gee of hy 'n lasbeheerstelsel verkies tesame met 'n verlaagde tarief. Aktiewe bemaking en marknavorsing oor die resultate behaal bepaal of die projek 'n sukses is. Heelwat ondervindings is in die USA op die gebied opgedoen. Sleutelemente van so 'n aksie is doeltreffende kommunikasie, die aanbod van geskikte finansiële aansporings en moontlik opleiding.

(v) Ander lasbeheeropsies in die huishoudelike sektor, beide aktief en passief, kan ook met vrag ondersoek word, soos:

- swembadpompe, sê  $200\,000 \times 1 \text{ kW} = 200 \text{ MW}$ ;
- ruimteverwarming deur middel van opgaarverwarmers en beter passiewe ontwerp van huise;
- stoof vragbeheerrelê wat waterverwarmer beheer;
- nuwe tegnologie soos sonenergie (water en passiewe ruimteverwarming), lug tot water hittepompe, ens.
- vermindering van kapasiteit van huishoudelike toerusting, insluitende waterbesparende toerusting en vloei-eibepalers: Dit is opmerklik dat die bestaande SABS spesifikasies slegs veiligheidsaspekte maar nie werkverrigting of spitsaanvraag spesifiseer nie;
- die langtermyn marginale kostebenedering vir die ontwerp van elektriese tariewe, veral deur middel van tyd-van-dag tariewe, gebruik word.

(vi) Die navorsing uitgebrei word na die effek op die nasionale spitsvraag, daar Eskom se spits om ongeveer 09h00 voorkom.

Ek het die vrymoedigheid geneem om die titel van die referaat te verbreed tot 'Lasbestuur in die huishoudelike sektor - watter opsies behoort ondersoek te word?' en my bydrae dus gerig op die breër onderwerp. Gebaseer op aktiwiteite wat in ander dele van die wêreld plaasvind bestaan talle opsies wat nog nie in diepte in Suid-Afrika ondersoek is nie. Die belangrikste bydrae wat ek waarsynlik kan maak is die van 'n bemerkingsbenedering soos in (iv) gemeld en nie die tradisionele tegnokratiese benadering in (v) benadering nie.

## MNR JOHAN BASSON, NASIONALE PROGRAM VIR ENERGIENAVORSING, WNNR

Meneer die President die referaat konsentreer basies op die ekonomiese en tegniese aspekte van lasbeheer deur middel van rimpelrelê en opsmoenderwys toon Mnr Coetzee aan dat die beheerbare las, 'n funksie is van die aantal waterverwarmers maal 2,3 kilowatt. Die gemiddelde las van die water verwarmers soos deur hierdie voorbeeld verkry, maal 'n syfer van 40 tot 50% as diversiteit en ek het toe op 45% gewerk. Dit is eintlik die teoretiese of tegniese potensiaal. Hy toon later in sy referaat aan dat vir praktiese faktore toegelaat moet word en dat dit nie heeltemal bereikbaar is nie.

Ek het toe met die syfers in die referaat, wat in die geval van Roodepoort bepaal was, beraam dat omtrent 'n kwart van die tegniese potensiaal bereikbaar is in die vorm van 'n werkbare potensiaal d.w.s. 0,25 maal die beheerbare las. In die geval wat gegee word is dit vir Roodepoort 89 watt of 0,213 sent per kilowatt uur of R1,3 miljoen per jaar. Maar dan moet in ag geneem word dat dit gebaseer is op 'n voorbeeld van een dag, en dit was in April, en daar is moontlik 'n paar ander faktore wat hierby gebring moet word.

My bydrae berus basies op vyf punte. Eerstens hoe word die teiken aanvraag bepaal? Tweedens, wat is die nasionale potensiaal as ons hierdie effek deurtrek. Ons kyk na 'n energiebergingsmetodiek van die waterverwarmer, en ons behoort ook met vrag te kyk na wat gebeur in die waterverwarmer self. Dan die baie belangrike punt en die referaat is redelik stil daaroor. Wat is die reaksie van die gebruiker? Logies, hy is die man wat betrokke is, is hy tevrede, al dan nie. En dan is daar natuurlik ook ander lasbeheeropsies wat ek kortliks wil meld.

As ons as byvoorbeeld kyk na die een kruis wat Mnr Coetzee gegee het, dan is die verskil tussen die groen en die blou dit is die waterverwarmerenergieverbruik of elektrisiteitsverbruik, dan kan u sien dat indien ons die teikenvraag stel by die spitsvrag in die middelmiddag, dan gaan ons waarsynlik nie daardie hoeveelheid energie in daardie periode kan vul nie. Ons kan dus nie die teikenaanvraag aftrek na die minimum toe nie en die voorbeeld meld 'n 110 megawatt as teikenaanvraag. Nou kan u sien dat dit is redelik maklik om daardie hoeveelheid energie in die vallei te voorsien en ook dat die tydperk wat die waterverwarmer afgeskakel word nie te lank sal wees nie.

Ek vol hierdie saak het meer aandag nodig en ook in terme van wat gebeur in die waterverwarmer. Daar sal ook gekyk moet word na wat gebeur in die ander seisoene. Ek het, agt data stelle van gemete waterverbruik in tipiese huise in die hande gekry en in die Somer het dit gedui op 193 liter per dag per huis, en in die Winter 264 liter per dag per huis. Ons weet dus dat die warmwaterverbruik neem toe in die Winter in vergelyking met die Somer, maar as ons in aanmerking neem dit is kouer water wat verwarm word in die Winter, dan het jy omtrent twee keer soveel energie nodig in die Winter as die Somer. So die Somer situasie gaan nie noodwendig dieselfde wees as in die Winter nie.

Ek het gemeld dat ons ook meer kennis nodig het oor wat in die waterverwarmer self gebeur en die aspek van die reaksie van die gebruiker. Die referaat meld verbruikers moet nie verontref word deur langdurige tydperke waar onvoldoende warm water beskikbaar is nie. Wat is langdurige tydperke? Wat sal hy verdra? En dan natuurlik word in hierdie geval, nie getoon wat die effek is wanneer die las afgesgooi is en dit weer terugeskakel word nie. Dit kan wees dat jou spitsaanvraag hoër is op hierdie stadium as dit nie op die regte manier hanteer word nie.

In die geval van Roodepoort is daar 'n skedule van die negte beheerkanale. Die kleinste een het 'n pickvrag van 7 megawatt, en as ons aanvaar dat al die waterverwarmers na afskakeling weer sal aan kom. Dit kan dan wees dat ons 'n stap gaan kry al minimum wat daardie aspek kan oorskry.

As ons kyk na die nasionale potensiaal en ek maak die aanname dat daar een miljoen waterverwarmers in die land is en ons werk teen 2,3 kilowatt elk met 'n geskatte faktor van 0,5 om by die beheerbare vrag te kom dan kom ons terug na 518 megawatt. Of dit op die nasionale spits geskied al dan nie, is nie moontlik om

op die stadium te sê nie. As ons dit kwantifiseer dan kom dit op 'n nasionale syfer van R93 miljoen per jaar te staan wat aansienlik is en waarsynlik iets is wat heelwat meer aandag regverdig.

Alternatiewelik, as ons werk op 2,3 kilowatt as gemiddeld per verbruiker en 45% diversiteit, dan is die beheerbare vraag 0,5 kilowatt Mnr Malan het netnou gepraat van 'n syfer van 1,6 kilowatt wat dus redelik konserwatief is en dit see ons R14 000 oor 'n vyftien jaar tydperk, alle kostes konstant geneem vir daardie betrokke waterverwarmers ons kan ook dink aan die investering van ander opsies om hierdie besparing te bewerkstellig.

Daar is dus ook ander moontlikhede. Een wat ons nog nie veel aan gedink het nie is waarom moet 'n swembadwaterpomp in werking wees by die spits? Ek het beraam daar mag 200 000 pompe wees van een kilowatt elk 200 megawatt kan dus deurmiddel van 'n redelike eenvoudige beheerstelsel afgekakel word. Ruimteverwarming – het ook betrekking op die berging van energie in 'n tydperk wat dit goedkoop is om te voorsien en te gebruik wanneer nodig. Stowe kan gekoppel word met die waterwarmer en sorg dat die twee nie gelyktydig in werking is nie.

En dan die vraag in die geval van ander toerusting. Is die kapasiteit van daardie toerusting korrek vir vandag se situasie. Moontlik kan ons meer aandag daaraan gee. As ek kyk na die waterwarmer self, dan het die groote natuurlik 'n effek op sy elektrisiteitsaanvraagpatroon, en die vraag is – gebruik ons die regte grootte? Moet ons nie kyk na 'n vertikale eenheid waar ons beter hitte uitruiling kry nie? Is die elementgrote die korrekte een? Ons sien die stygende tendens wat tans vryalgemeen 4 kilowatt is. In Israel byvoorbeeld word daar bepaal dat die element nie meer as 1,5 kilowatt mag wees nie. Miskien moet ons dink aan 'n groter eenheid met 'n kleiner element.

Die kontrolestelsel van die waterwarmer self behoort miskien 'n groter dooieband tussen die aan en af skakeling daarvan te hê met beheer op twee vlakke. As ons die water temperatuur kan verhoed dan het ons meer energie in die waterwarmer en ons kan dan vir langer tydperke die waterwarmer uit bedryf uit neem. Die volume waterverbruik en die faktore wat daar 'n rol speel is die waterdruk, die toebehore wat gebruik word, die gesinsgrote, die inkomste die lewenswyse en waterverbruikspatroom d.w.s. wanneer gebruik hulle die warm water en dan ook die aspek van isolasie.

Dan wil ek afsluit Meneer die President deur na die sosiale aspekte te verwys. Ek dink dit is die belangrikste aspek van almal, en dit is die een waaroor ons miskien die minste weet. En dink ons kan miskien gaan kyk na wat die demokratiese Amerikaners doen. Hulle sal nooit 'n stelsel soos hierdie installeer en vir die gebruiker sê jy moet dit gebruik nie. Hulle sal vir hulle sê, "Mense hier is 'n opsie, ons is gewillig om die opsie vir jou te voorsien op ons koste of teen 'n nominale koste, maar jy kry 'n spesiale tarief of 'n rebat op jou tarief en dit is jou keuse of jy dit wil hê of nie."

Wat ek basies wil sê, ons moet kyk na 'n bemarkingsbenadering. Dat ons hierdie tipe van benadering bemaak en dan meet ons die sukses deur middel van die aantal mense wat daarby inskakel.

Ek het ook verwys na die ander opsies. Ek dink ons kan met vrug daarna kyk en dan kan ons werklik sê dat ons na lasbeheer in sy volle potentiaal gekyk het.

#### PRESIDENT:

Ons waardeer die bydrae wat ons van die twee here gekry het, mnr Malan en mnr Basson.

#### MNR JD ALGERA: RUSTENBURG

Ek dink ons moet ook kyk na die voordele wat jy kan verkry uit 'n vraagbeheerstel en ek dink aan Rustenburg se geval. In 1984 het ons 'n vraagbeheerstel geïnstalleer en twee weke daarna is die Eskom Trident substatie opgeblaas wat die hele Noordwes-Transvaal sonder krag gelaat het en ons net 'n beperkte toevoer gekry het. Onmiddellik het ons die publiek die voordeel van vra-

gbeheer gegee deur die geisers vanaf 'n sentrale punt af te skakel en die res van die fasiliteite soos kook en beligting aan die mense te voorsien.

Die tweede voordeel is natuurlik die verbetering in die lasfaktor. Die gemiddelde lasfaktor per maand voor die instelling van vraagbeheer was redelik laag en dan daarna was die verbetering ongeveer 10% in ons geval. En dan kan u dit terugwerk na die wins of die voordeel wat u daaruit kry, soos Mnr Coetzee aangedui het.

Ons het met tye die geisers almal afgeskakel en met tye al die geisers aangeskakel en u kan sien hoe 'n groot bydrae van die geisers elke keer so gewees het indien dit aangeskakel was. Dit gee 'n redelike gemiddelde plat kurwe reg deur die dag.

Dankie meneer die President.

#### MNR JA LOUBSER: BENONI

Meneer die President ek is op die oomblik besig met die installering van so 'n rimpelbeheerstelsel en ongelukkig is daar nou 'n paar sake wat my pla miskien hou ek nie heeltemal by die referaat wat gelewer is nie, maar nogtans sal die deskundige kennis van persone soos meneer Botes en Coetzee vir my baie handig te pas kom.

Die eerste saak, meneer die President, is dat daar blykbaar op die oomblik relés op die mark is, wat programmeerbaar is. Wanneer jy 'n algehele kragonderbreking het kan hierdie programmeerbare relé so gestel wees dat die krag afskakel en af gaan bly terwyl jy die krag herstel. Ons almal het al algehele kragonderbrekings gehad en dit is gewoonlik 'n groot probleem om daardie krag terug te kry as gevolg van die addisionele vraag.

Nou wil ek net weet of ons gebruik maak daarvan. Daar is ongelukkig 'n nadeel aan verbonde en dit is, as die krag af is, of vir 'n rukkie, af was dan gaan by nie dadelik as die krag terugkom, die geiser weer aanskakel nie. Dit beteken dat die kontrakteur wat herstelwerk moet doen, soos byvoorbeeld om 'n element te vervang nie sy werk kan toets en dit mag lei tot peutering met die relés.

'n Verdere vraag wat ek wil vra, gaan oor die installering van relés. In Rooodepoort se geval is dit gedoen deur privaat kontrakteurs of het u, u eie personeel gekry? Het u hulle 'n bonus betaal op stuk werk of iets dergelyks?

#### MNR RR GILMOUR

I would like to take part in the discussion as I got involved as early as 1953 in the studies of load control, and it was in 1954 that we started a pilot ripple scheme in Cape Town and I learnt quite a lot as a result thereof.

Now it is well known by Engineers involved in this technique, there are a number of ways of signalling and a number of other uses such as street lighting control, air raid or other sirens etc. Another use I had in mind was there dimming of traffic signal halogen lamps at night.

I wonder if the authors have experienced interference problems which I have found to be twofold. For example spurious and other harmonics generated by certain apparatus triggering the ripple relays, such as mercury arc rectifiers traction systems, as I discovered years ago, when a 650 Hz component triggered 690 Hz tuned relays. On the other hand complaints were occasionally received from recording enthusiasts when the pure ripple appeared on the recorded item.

The frequency was subsequently increased to 750 Hz while other manufacturers were going above one kHz. Now in my recent studies I found that the tendency is now to use much lower frequencies, for example of the order of 250 Hz. It would be interesting to learn if the system in Rooodepoort is a pure tone system and if so, what the frequency is.

My conclusion is that pure tone ripple system had definite advantages and apart from simply switching off water heaters to reduce the demand on a system, it can include other apparatus such as for example pool filtration plants which can account for another 1 kW each, probably more. Furthermore it could also



with advantage be used in conjunction with other load shedding schemes such as underfrequency computer controlled systems when it is obviously desirable to restore the load as gradually as possible.

In our earlier tests it was found that about 40% of installed water heaters were connected during the evening peak and it appears that this is more or less the operation in Roodepoort.

I would like to know if any consumer resistance to this form of water heater control has been encountered in Roodepoort.

#### MR FLU DANIEL: CAPE TOWN

Some practical aspects of load control. What legislation was necessary to introduce in Roodepoort to make the installation of these relays practical? Did you have to modify your regulations or was it simply forced upon the consumers?

Secondly the installation of the units themselves, was special provision made in the consumers' equipment to accommodate the units or had it to be as an add-on system when it was installed ultimately?

Thirdly the cost of installation. Was it partly borne by the consumer or fully by the Council itself?

And lastly has Roodepoort given any consideration to some form of special tariff to encourage the installation and use of the system.

#### MR DT LIEBENBERG: AFFILIATE

I would also like to add my congratulations to Mr Coetzee for an interesting paper. It is interesting to note that in a recent feasibility study on ripple control for one of our clients, we also arrived at a figure of 40% for the average controllable portion of the installed geyser load.

We are of the opinion that it is not only important to look at the immediate annual savings of load control, but also to investigate projected savings over the expected lifetime of the installation. As variables like the ESCOM kVA tariff and the growth of the energy consumption increases over time, the savings pattern will change and may change dramatically.

We used the discounted cash flow method used in investment analysis in a recent feasibility study to determine the projected savings over a twenty year period and I would like to relate some of the interesting results of this analysis to the meeting. Briefly discounted cash flow analysis is a method whereby a savings is calculated for each year over the period based on the most likely values for variables like ESCOM tariff increase, demand growth, interest rate etc. Unfortunately, as your Treasurer will tell you, savings in future rands are not the same as present day savings and the time value of money has to be taken into account. A savings of R10,00 next year is of more value than R10,00 saving in say 5 years time. Consequently, each annual saving has to be discounted by the appropriate figure. These discounted savings are then added together to arrive at the net present value of total expected savings over the 20 year period. In this particular case even with a high discount rate of 17% which the Town Treasurer insisted upon, the net present value was some 32 times higher than the initial annual savings.

The beauty of this method is that it can be done on a computer spread sheet and sensitivity analysis performed, in other words each variable can be changed individually or collectively to their worst possible value to gauge their effect on the net present value of the savings.

Some of the results of this analysis were quite surprising.

The net present value for instance is not sensitive to the interest rate or the actual capital cost of the load control equipment. For every 1% increase in the capital cost, the net present value would decrease by 0,21%. For every 1% increase in the interest rate the N.P.V. would drop by only 0,163%. The N.P.V. is reasonably sensitive to demand growth: for every 1% increase in the demand growth (assuming that only additional relays would be required and no additional transmitting equipment) the N.P.V. would increase by 0,6%.

The N.P.V. is sensitive to the initial MVA savings, the discount rate and ESCOM tariff increases. For every 1% increase in these variables the N.P.V. would increase by 1,3% in the case of the initial MVA savings; increase by 1,09% in the case of the ESCOM tariff increases and decrease by 1,36% in the case of the discount rate.

In conclusion thus, as these figures indicate, it is important to take future savings into account when doing a feasibility study as these can have a marked effect on the payability of load control in particular where your expected initial savings may be small or even negative.

#### CLR JULIUS CIVIN: BEDFORDVIEW

Mr President you had to give me a chance, if only to get through to Mr Piet Botes that members of Management Committee are interested in saving money.

Mr President when I got involved at Bedfordview about ten years ago in Council, we already had a load shedding system. Not quite as sophisticated as our present one. We had an old control unit which took about an hour or two to switch on and an hour or two to switch off, and we used to bring it on, on a time system. Half past five in the afternoon it would switch off all the geysers and at seven o'clock they would all come on. You got a bit more sophisticated since then. We now have a radio controlled motorola control system with small switches in each of the geysers.

We have had quite spectacular results since we put in the new computerised switching system. We've got ten channels so do not have to switch everything off at once. When we are allowed a certain amount of load we can bring in, say two channels at a time and give them each a turn. Our load factors from being an average of 62% before, we are now reaching over 70%. In July two months ago, we achieved an all time high of 74,2% and that in our Town meant a saving of R75 000 per month in simple terms.

We do have our snags, unfortunately when you are a Councillor you get a phone call from one of your constituents. On Sunday your geyser wasn't working, she spent considerable time finding an Electrician over the weekend to go out to her place to have a look at the geyser and then he tells her that there is nothing wrong with the geyser, she must contact the Council. You can imagine how she spoke to me.

Mr President we have had other little snags. Unfortunately these units when they fail, they fail so called safe. In other words the geysers come on.

Our radio tower is in our neighbouring little village called Johannesburg up on the hill and they supply us with electricity to work the transmitter. Last month they had an electricity breakdown, our transmitter stopped transmitting right in the middle of a cold spell. We have standby batteries that took over. They worked for five hours and then they collapsed and then right in the middle of a cold spell all the geysers came back on again. We have now spent roughly a R100 000 on back-up systems all the way, that this should not happen again.

I want to finally put the comment across that the whole system is a compromise. You have to compromise between the inconvenience and the savings and the essential factor is, how accurately we can set our target demand for that particular month.

And then of course finally, this whole exercise would be a waste if Eskom changed their tariff rating and not have a demand charge.

#### MR DC PALSER: HONORARY MEMBER

Mr President, the authors are to be congratulated on a well-researched paper giving, as it does, a lot of useful local statistical information that up to now has not been readily available.

I have always taken a keen interest in ripple control, although Cape Town, apart from a small trial installation some thirty odd years ago, has never employed such a form of load control. As you are aware though, Cape Town did introduce a similarly ef-



fective form of load management with its Steenbras pumped storage scheme.

I must, however, differ with the authors on their method of assessing the economic viability of ripple control. Ripple control can, in fact, prove to be far more economically viable than their figures would at first glance appear to indicate.

Firstly, I do not believe that it is necessary to go to all the trouble of calculating the mean cost per unit for different load factors and then determining the annual saving by difference, as is done in the paper.

All that is really necessary is to take the average water heater capacity of 2,3 kW mentioned in the paper, and multiply this by the controllable portion at peak time of around 40% to 50%, to give an average controllable peak load of about 1 kW per water heater. With ripple control the authors after-diversity demand curves indicate that this 1 kW peak can be cut by about 50% at time of system peak, giving an effective system maximum demand cut of about 0,5 kW per hot water cylinder.

The annual saving is then twelve times the monthly demand charge of R15,65 per kW, namely about R188, times the average reduction in load of about 0,5 kW. This gives an annual saving of around R94 per water heater.

One has then merely to relate this R94 annual saving to the mean cost per ripple control receiver installed, namely the total installed cost of all transmitting and receiving equipment divided by the number of receivers.

If one assumes an electricity tariff escalation rate of, say, 10% per annum and a monetary interest rate of, say, 13% per annum, giving an effective or real discount rate of around 3% per annum, then the relevant capitalisation factor can be obtained, as explained for instance in my paper on Engineering Economics presented at the AMEU Convention in Durban in 1981. Multiplying this capitalisation factor by the annual saving of R94 gives the following capitalised savings for periods ranging from one to five years.

No. of years	Capitalised saving (R)
1	91
2	180
3	266
4	349
5	430

The capitalised saving, or the present value equivalent of the relevant demand saving cash flow series, can then be directly compared to the mean capital cost per ripple control receiver to determine the economic break-even point.

For example, if the average installed capital cost per receiver today is, say R250, then break-even will be within about three years. For an installation that probably has a useful life of say, 15 years or so, this clearly indicates that ripple control can prove to be an excellent investment, particularly for the smaller municipalities with largely domestic loads.

From the foregoing it should be clear that, from the economic standpoint, there is no need to consider the redemption of the load, as is done in the paper. This is a purely accountancy procedure and is quite irrelevant to the economic study. The accountancy procedure, however, is useful in illustrating actual cash flows and the annual savings when the capital cost is amortised over a relatively long period, such as the 15 year period mentioned in the paper for loan financing.

Regarding system load curves I have a suspicion that not all municipal load curves are as peaky as those illustrated in the paper. Clearly if there are no suitably close valley periods within which to restore the water heater load, because of relatively high adjacent commercial or industrial peaks, then ripple control will not be as practical, or could even prove to be uneconomic. For most municipal electricity undertakings, though, there is little doubt that ripple control should prove economic in varying degrees.

## MR KEN MURPHY: SOMERSET WEST

Mr President may I also congratulate Messrs Botes and Coetzee on their presentation.

We installed a load management system in Somerset West approximately five years ago and have long since recovered our capital outlay due to the savings in maximum demand charges.

Ons het ook gou tot die gevolgtrekking gekom dat dit net vir ons en die verbruiker ergens veroorsaak indien klein silinders met 1,5 kW elemente afgeskakel word.

We found that spec builders were building large houses with small hot water cylinders.

After submitting a report and recommendations to my council, the following By-law to amend the Standard Building Regulations was submitted to the Provincial Council and gazetted viz.

"That the minimum capacity of hot-water cylinders in the Somerset West municipal area be determined as follows:

a(1) Any two bedroomed house, flat or semi-detached house – 150 litres with a 3 kW element.

b(1) Any three-bedroomed house, flat or semi-detached house – 200 litres with either a 3 or 4 kW element.

b In cases where more than one hot-water cylinder is installed in any dwelling, that the minimum capacity thereof will be determined by the Town Electrical Engineer.

(and just in case anyone didn't know)

c All hot-water cylinders are to carry the mark of the SABS."

Waar daar meer as een warm water silinder in 'n woning is konnekteer ons hulle in parallel deur die geleistam in die verdeeikas deur te saag.

In Somerset-Wes is die rels departementeel geïnstalleer met groot sukses. 'n Bonus van R2,00/rel nadat sewe rels op 'n dag geïnstalleer is aan die elektrisiën en 'n derde van die bedrag aan sy helper betaal. Tot 12 rels per dag is geïnstalleer. 'n Volledige verslag van elke installasie is gevea en ons het dus nou baie goeie rekords. Kontrole is ook gehou deur installasies op 'n stadsplan af te merk soos wat dit gedoen is, wat nou nog nuttig is.

'n Kaart liaseerstelsel is in gebruik gestel wat alle tersaaklike inligting bevat.

Daar is natuurlik baie ander byvoordele wat in die geval van 'n marginale wins op die aanvaargkoste wel 'n onderneming nogtans kan oordeem om 'n rimpel beheerstelsel aan te koop. Soos by las-afwerking, beheer van straatligte en die uitsel van duur stelselversterkings aangesien die las nie onbeheersd kan toe neem nie. Dan staan die ESKOM kVA aanvraagtarief nie stil nie.

Verder stem ek saam met die gevolgtrekkings en bedank die skrywers vir 'n interessante referaat waarvoor daar al vir 'n geruime tyd 'n leemte bestaan.

## MNR PJ BOTES: ROODEPOORT

Mnr die President, dames en here ek wil net graag die maklike vroe beantwoord. Die moeilike vroe sal Kallie beantwoord. Ek wil eers graag vir Jan Malan en vir mnr Basson bedank vir hulle bydraes wat baie positief was tot ons referaat, baie dankie.

Een saak wat ek net graag wil noem, dit is 'n noodsaaklikheid dat hierdie tipe lasbeheer in Suid-Afrika vervaardig behoort te word. Daar is sekere stelsels wat in Suid-Afrika vervaardig word, maar ek dink dit is noodsaaklikheid in landsbelang dat ons in Suid-Afrika ook vervaardiging van hierdie lasbeheerstelsels sal moet kry.

Die reaksie van die verbruiker. Ons het gevind dat waar daar gesinne is van ses persone, dan gaan baie van hulle van ses uur se kant af bad, een na die ander, en in daardie geval het jy oneindige probleme en klages. Eers het ons hulle op 'n spesiale kanaal geplaas waar ons hulle so min as moontlik verontref het, maar later het ons weg gedoen met daardie kanaal, want almal wil natuurlik op daardie kanaal kom.

Dan het ons 'n ander interessante geval gevind. Huisgesinnee waar daar tweeling babas is, kla gewoonlik oor die lasbeheer. Dit is nogal verbasend, ek weet nie of daar enige rede voor is nie. Ons probeer om die lasbeheer, nie langer as twee uur en eintlik net een uur die krag af te skakel en dan weer terug te plaas. Die gedagte is om die geiser omtrent 20 minute kans te gee om te herstel.

Daar is mense wat nie lasbeheer wil hê nie en ek het gemeen om 'n tarief daarvoor in te stel, maar my Stadtesourier reken dat die rekenaar wat by het kan nie sulke dinge hanteer nie en gevolglik kan ons blykbaar nie so iets instel nie.

Mnr Jan Loubser ons het dit self geïnstalleer. Ons het 'n bonus stelsel vir ons personeel gegee in die begin en toe het ons 'n paar van hulle gevind waar hulle vreeslike bonusse gekry het. Ons het gaan ondersoek en gevind dat hulle net die relê binne in die dak gesit het en toe gemaak het dat hulle wegkom, sonder om op te koppel.

Nou die dag was ons besig met 'n stelselmatige ondersoek na alle lasbeheerstelsels en toe het ons afgekomp om een of twee van hierdie gevalle wat ons nog gehad het. Maar ons het dit self gedoen en op die huidige oomblik word dit outomaties gedoen wanneer 'n nuwe aansluiting gedoen word.

Ek kan net noem dat mnr Algera gereken het dat ons 'n maandelikse lasfaktor het vanaf 1965 tot op datum. Daar teen 1965 het ons maandelikse lasfaktor in die omgewing van 53,5% gewees. Op die huidige oomblik kry ons in die somer maande gereeld oor die 70% en plus, en self nou in die winter maande. Een maand in die winter het ons ook oor die 70% gekry. Die lasfaktor sal natuurlik verander oor die jare maar dit is naasteby die verbetering wat daar by ons is.

Mr Gilmour the cost of running all the relays to operate a few relays only to control the lights in the robots, I don't think it is worthwhile to let all these relays run, just for the control of those few. It all depends what type of system you've got of course.

Mr Fred Daniel - In Transvaal this has been in the Electricity Standard By-laws for years, so you are able to do that in the Transvaal. We've incorporated it in our Standard By-laws. We more or less had an add-on system and then the cost of the load control relay was initially borne by a loan. Thereafter we tried to make it part of the connection fee for new consumers but we had complaints and also the powers that be told us that, this was

not to be done. So we stopped and just carry the cost out of revenue.

A special tariff. I have mentioned that I have a special tariff and I think this may in future be a very good way of applying your tariffs. As I mentioned in my address we disconnect the maximum demand during the periods when load control is not running and only charge the maximum demand tariff from the point when we start with load control of the system.

Mr Liebenberg I can only say that long term analysis is necessary as you say. One must do that. I think most of our assumptions are on the short term and on the present situation as it is.

Councillor Civin we used to have a time system. It had a lot of shortcomings. The same system now is on a micro-computer and it works very well. Some of the aspects we have designed ourselves and I think our system works very well.

One point I must make, if you have complaints from the public about a geyser, you must attend to it immediately. Don't send the Electrician tomorrow if the consumer complains now. You attend immediately, and that is what we do in Roodepoort, and it is appreciated by the public. It is essential to do that.

Mr President I think I will leave it to Kallie to answer the balance of the questions.

#### MNR K COETZEE: ROODEPOORT

Ek sal kort wees. Mnr Basson in my referaat hoofstuk vyf verwyk ek na die bepaling van die lasteiken en ongelukkig sal die tyd ons nie toelaat, en is dit in elk geval nie binne die bestek van die referaat, om die bepaling van die lasteiken self te bepaal nie.

Mnr Loubser ons het nog nie programmeerbare relês in gebruik in Roodepoort nie. Ons is van plan om dit met die volgende tender wel te spesifiseer. Ons ondervind geen probleme met kontrakteurs wat peuter met die installasie, met die relê as sulks, nadat hy die element vervang het nie. Ons het 'n redelike goeie verhouding met die kontrakteurs in Roodepoort.

Mr Gilmour we use a 1050 Hz pure tone system and we also control the street lights and up to date, we have only experienced one instance where the load control activated a TV antenna amplifier into an unstable state, but it was entirely the fault of the amplifier itself.

Baie dankie.

## DISTRIBUTION CLASS SURGE ARRESTERS: BY MR R MDOONE: TECHNICAL DIRECTOR: BOWTHORPE EMP



Mr Rod Doone, Technical Director, Bowthorpe EMP, delivering his paper on "Distribution Class Surge Arresters".

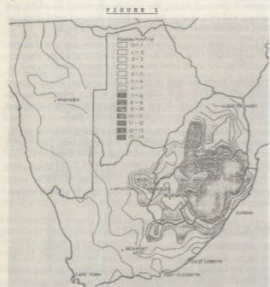
#### INTRODUCTION

The lightning arrester or surge arrester is an essential component in any power distribution system exposed to atmospheric discharges. Since the late 1940's the conventional gapped surge arrester has been employed to protect power transformers, cables and other terminal equipment from transient voltage conditions.

The decision as to whether to use surge arresters in place of protective gaps is complex and dependant upon both technical and commercial factors; most Power Utilities have developed internal policies to suit their particular circumstances. However, a major consideration is the frequency and severity of thunderstorms.

In South Africa, the National Electrical Engineering Research Institute (NEERI) through the Council for Scientific and Industrial Research (CSIR) have set up equipment and monitored the lightning activity throughout the country. The results of recordings are represented as lightning ground flash density or the number of lightning to ground flashes per KM<sup>2</sup> per year.

The results of this work show an interesting pattern of lightning activity with the highest densities being in the Transvaal and Orange Free State, see Fig. 1. In general, the highest lightning activity is associated with the elevated land mass where the lightning to ground flashes per  $\text{KM}^2$  average 10-12 per year.



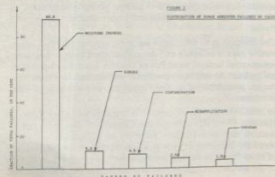
LIGHTNING GROUND FLASH DENSITY (1975-1982) GRONOWE (RUGGIE) ET AL

The work of NEERI and CSIR clearly confirms that much of the ESCOM 11 kV and 22 kV overhead distribution system is exposed to considerable lightning activity and therefore demands reliable protection for terminal equipment.

The lightning surge duty imposed on surge arresters is dependant upon the proximity of the arrester to the strike and whether the strike is direct or indirect to the overhead line. Once again, the work conducted by CSIR and the Electricity Supply Commission has proved invaluable for surge arrester designers and utility engineers alike. Actual measurements on an installed test line in South Africa have yielded useful data<sup>2</sup> and confirm that an arrester with a surge current rating of less than 10 kA is unlikely to give satisfactory service in areas where lightning ground flashes exceed 6.2 per  $\text{km}^2$  per year.

### SURGE ARRESTER PERFORMANCE

In general the specification issued by utilities for the purchasing of surge arresters should have resulted in reasonable service performance. However, this has not been the case with many utilities reporting unacceptable failure rates. The reported poor service performance of surge arresters has been investigated by a number of authorities but perhaps the most extensive work was undertaken by Ontario Hydro Research<sup>3</sup>. The results of the aforementioned work showed that moisture ingress is by far the most predominant cause of arrester failures, accounting for nearly 86 per cent of all failures. See Fig. 2.



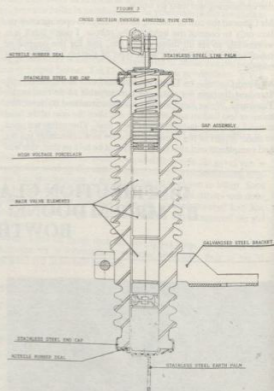
Furthermore, the reported study showed that unless failed arresters are carefully analyzed, the cause of failure can often be erroneously attributed to lightning surges, since many failures occur during thunderstorms. In reality, the true cause was found to be leaking seals with a consequent ingress of moisture and lightning surges serve only to trigger failures. Without moisture in the arresters most surges would be harmlessly discharged.

It will therefore be apparent that adequate electrical specification for surge arresters alone will prove to be useless if the mechanical integrity cannot withstand service conditions. The surge arrester manufacturer has therefore to ensure that the internal components are encapsulated in a housing which will remain sound for the anticipated working life of the arrester.

### SURGE ARRESTER CONSTRUCTION

The international standard covering surge arresters IEC 99-1 1970, is currently being revised to incorporate Metal Oxide or gapless surge arresters and also Working Group 5 is considering the mechanical aspects. However, at present the standard only demands that surge arresters should be suitable for defined normal service conditions without any specific type testing<sup>4</sup>; this situation currently places responsibility with the manufacturer to ensure mechanical integrity.

Bowthorpe EMP has taken full advantage of service experience and used proven techniques in the design and manufacture of their range of Distribution class surge arresters. Particular attention has been given to porcelain and to end cap seal. Figure 3 shows a cross section through the Bowthorpe EMP successful CSTD design. The CSTD surge arrester is a conventional series gap silicon carbide type fully complying with IEC 99-1.



The internal construction utilizes a 31mm diameter ceramic valve resistor and multi-gap system developed in the early 1960's and having over 27 years proven service. The gap and resistor assembly are hermetically sealed within a high grade fully vitreous high voltage porcelain. The quality of the porcelain housing is of paramount importance and homogeneity throughout the body is essential. The reason for this requirement is that under normal service conditions a high radial voltage stress will be present particularly in the region of the mounting bracket

and voids or imperfections will lead to porcelain puncture and arrester failure.

The end caps of the CSTD design are manufactured from stainless steel of proven anti corrosion quality. Each end cap is held under compression against a high stability nitrile rubber seal. The stainless steel terminal palms are electrically welded to the end caps thereby eliminating the risk of seal damage during installation.

The foregoing encapsulation system has been adopted by Bowthorpe EMP for its complete range of distribution class surge arresters suitable for systems up to 33 kV. Many thousands have been installed since the design was introduced in 1980 with no recorded failures attributed to moisture ingress.

#### METAL OXIDE SURGE ARRESTERS

The conventional gapped silicon carbide surge arrester has over the years proved itself to be a reliable and cost effective means of providing overvoltage protection for power systems. However, the introduction of the Zinc Oxide Varistor in the early 1970's allowed a surge arrester to be produced without gaps. Many papers have been published on the subject of gapless arresters but very few have taken a critical and comparative view point. Generally, the metal oxide surge arrester offers improved performance for a given volume of material. However, great care should be taken where system voltage variation may be large. For example a gapless metal oxide surge arrester may withstand a temporary overvoltage of only 1.04 per unit for 1 000 seconds. The same rating of conventional arrester can withstand 1.10 per unit for the same period<sup>5</sup>. However, the benefits in greater energy capability and more stable protective characteristics can be utilized to advantage.

Perhaps one of the greatest drawbacks of the conventional gapped surge arrester is the apparently random behaviour of series spark gaps.<sup>6</sup> It is generally accepted that better protection can be provided by gapless surge arresters even to the extent that normal system insulation levels can be reduced with considerable cost savings.

At the time of writing this paper Technical Committee TC37 is currently considering a draft document 37 (Secretariat) 68 January 1987<sup>7</sup>, and it is hoped that acceptance of this document will provide utilities with essential guidance.

#### SURGE ARRESTERS - AN ADVANCED DESIGN

The basic mechanical format for distribution class surge arresters has not changed over the past 40 years or more. A critical view of any conventional designs will reveal the following limiting features:-

- 1) Active elements constitute less than 40 per cent of total weight.
- 2) Arrester easily damaged by mishandling or vandalism.
- 3) Internal electrical failure can lead to explosive shattering.
- 4) Low mechanical strength of terminals.
- 5) Performance adversely affected by pollution.
- 6) Difficult to locate when faulty.

Bowthorpe EMP considered that a metal oxide surge arrester which could overcome these limitations would prove extremely advantageous. Following some 8 years of development work the 'E' Series distribution class surge arrester was put into production. Figure 4 shows a cross section through this novel design which utilizes a polymeric heat shrink housing over metal oxide elements. The metal oxide elements are bonded together to form a very high strength core. The complete surge arrester weighs 50 per cent less than its porcelain housed metal oxide equivalent.

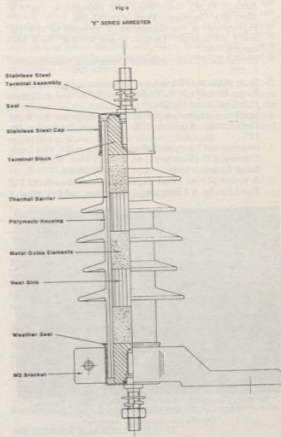
The mechanical strength of this polymeric housed arrester is very high (Cantilever 500 NM) exceeding that of a standard support insulator. The high strength of the assembly allows the arrester to also be used as a cable support insulator thus saving considerable costs of steelwork and associated hardware at underground cable to overhead line terminal poles.

Under simulated fault conditions, by wiring out the metal oxide elements, the 'E' Series polymeric arrester has withstood over 16 kA for 0.2 seconds without impairing its working cantilever and torsional strength.

The manufacturing process ensures that the heatshrink polymeric housing is shrunk onto the metal oxide core under high vacuum, and a semi-fluid polymeric based mastic fills all voids within the assembly. The foregoing technique ensures no moisture ingress can occur in service.

The 'E' Series polymeric surge arrester is currently available for all distribution system voltages up to 33 kV and is suitable for use in areas of heavy natural or artificial pollution. The arrester has been fully type tested and is in service throughout the world.

In order to monitor the service performance of this unique product it has been installed on various test lines including the 10 km 11 kV rural test line<sup>8</sup> operated and monitored by ESCOM and NEERI; this test line has been instrumental in providing valuable data of actual service duty.



#### FUTURE DEVELOPMENTS

The success of the polymeric housed surge arrester has been very encouraging and given further impetus to extend the design. At present, trials are taking place with designs suitable for 66 kV and 132 kV systems and it is hoped to have suitable types in production by early 1988.

The lightweight, high strength construction of the polymeric housed surge arrester lends itself to a modular construction technique and work is proceeding in this direction. The aim of this development work is to manufacture 12 kV or similar modules which can then be quickly assembled on site for any system voltage up to 400 kV.

Further work is engaged in developing high strength lightweight terminal pole cross arms which can be used to anchor overhead lines and support underground cable terminations with integral surge protection.



## CONCLUDING REMARKS

Surge arresters have improved considerably in their construction and performance over the past 10 years. However, this has only been possible by careful observation from service experience of earlier designs and the use of improved materials and manufacturing techniques.

The Author wishes to record his thanks to the organisations involved in publishing their work on lightning and power systems; particularly notable in this field is the work of CSIR, NEERI and ESCOM whose published papers have been of considerable assistance.

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Mr Henri Geldenhuys, Head of the Lightning Studies Division, NEERI of the CSIR, contributing to the paper on "Distribution Class Surge Arresters".

## MR ROD DOONE: AFFILIATE

I would first of all like to record my thanks for being invited to present this paper to the 50th Convention of the AMEU.

I trust that you have had the opportunity to read the paper in which I have attempted to provide background information leading to a new and advanced design of surge arrester. I hope I have also provided you with some interesting details regarding surge arrester performance.

Before showing you some slides of the new design I would like to emphasise the main limitations of the conventionally housed porcelain surge arrester. On page 6 of the paper they are listed as follows:

- 1) Active element constitute less than 40% of the total weight.
- 2) Damage can result by manhandling or vandalism.
- 3) Internal electrical failure can lead to explosive shattering.
- 4) Low mechanical strength of terminals.

- 5) Performance adversely affected by pollution.
- 6) Difficult to locate when faulty.

How then can we overcome the above limitations?

The Power Industry is by nature conservative, as reliability of equipment is only achieved by extensive testing and service evaluation.

In the last two decades reliable Polymeric insulation has been developed for High Voltage use and Bowthorpe EMP opted to use a heat shrink Polymeric material which has seen service in cable terminations since 1972. The use of a Polymeric housing, demands that the mechanical strength for the arrester to be achieved by other means.

Using a patented technique we are bonding the metal oxide elements together into a single column; this column is then wrapped under vacuum in a glass fibre cloth impregnated with a specially formulated resin. The final result is a central core of phenomenal strength. External electrical insulation and weather protection is provided by the shedded Polymeric one piece housing.

The whole assembly procedure is completed under vacuum and the resin ensure that no voids occur. A surge arrester produced in this way is totally impervious to moisture ingress as extensive testing has proved.

Traditionally surge arresters are separately mounted from cable terminations or transformer bushings although some authorities mount the arrester on the transformer tank. The E series arrester has sufficient strength to replace support insulators thus saving expense of a set of insulators and the cross arms for separately mounting the arresters.

Furthermore tests have shown that there is no risk of explosive failure so that there is no risk of damage to transformer bushings or other equipment.

I hope that with the following set of slides I can demonstrate how this can be achieved.

1. Innovation by Bowthorpe - EMP. (Lighting strike with title)
2. Lighting Need Only Strike Once. (Lighting strike with ground)
3. Conventional 11 kV terminal pole with T/F.
4. Conventional 11 kV terminal pole with cable.
5. Conventional 11 kV terminal pole (dif angle).
6. Conventional porcelain housed 11 kV arrester.
7. Alternative Polymeric housed 11 kV arrester.
8. Polymeric 22 kV arrester.
9. Polymeric 33 kV arrester.
10. Conventional 11 kV pole and support insulators and surge arresters and supporting steelwork.
11. The polymeric surge arrester alternative where the arrester supports the cable - calculate the cost savings for this pole.
12. Putting the alternative into service rate its strength. It is quite permissible to assemble on the ground and lift it to the pole head.
13. A further view of installation practice.
14. A completed polymeric installation.
15. A reminder of the conventional.
16. A further installation where costs could be cut dramatically.
17. You will recall that I stated that this design could not fail explosively. The following slides are proof from the short circuit test station.
18. This slide shows the setting up of a high speed commerce for recording the tests.
19. A conventional 11 kV porcelain housed before test.
20. A conventional 11 kV porcelain housed after test. Not much left in this case.
21. A polymeric 11 kV arrester before test.
22. A polymeric 11 kV arrester after test - same as the preceding porcelain type 16 kA for 0.2 seconds.



23. A polymeric 22 after test.
24. A 33 kV polymeric arrester before test.
25. A 33 kV polymeric arrester after test.
26. Tomorrow's Technology Today.

The development of the E Series Polymeric arrester has been the result of some 8 years of intensive work and I am pleased to say that sales are rapidly increasing since its commercial introduction 2 years ago.

I would like to conclude my presentation by showing you a short clip of high speed film taken during development work.

Filming short circuits resulting the power arcs is not easy, but it was essential to the success of this design.

We will see on this film what happens when we stimulate a service failure by shorting out the internal elements with a fuse wire as demanded by the IEC 99-1 standard for arrestors.

I will apologise in advance for the fact that this is not comparable with a Cecil B de Mill production and also is in Black and White.

I will give some comment to make up for it being a "Silent Movie".

That concludes my presentation this morning. I hope that you found it interesting. The 'E' range Polymeric arrester may be examined on the Bowthorpe Hellerman Deutsh stand.

Thank you for your time.

#### MR MAX CLARKE: RANDBURG

Mr Doone's paper provides another useful reference work on a subject of great importance to the electricity supply industry, and I thank him for his presentation. I also thank him for the presentation per se of the films and the slides, which of course, were not available to me when I prepared my comments.

His pen sketch of some of the developments which are taking place in surge arresting devices is of more than passing interest to many of us practicing supply engineers, who have listened here today.

My only regret is that time did not allow him to broaden the scope of his paper a little, to cover some of the everyday peripheral factors, which are of great significance to us users.

For example, reference is made to the "Ontario Hydro" research into arrester failures from which it has been established that moisture ingress played a major part. It would be interesting to know to what extent supposedly "protected" supply equipment, in other words transformers, cable ends and so on, have been damaged because of poor installation practices of the arrestors, rather than the actual arrester failure itself? I have in mind for example, inadequate earthing which is a major problem and also poor methods of connection.

Could he elaborate on this aspect and perhaps give some typical values of earthing resistance on different systems, if he has any figures available?

Problems often arise also during the installation because of conductor sizes and fixing methods. It is very nice to see some of the clamping devices that have been shown here, but we all know to our horror, I think, that when the Linesman gets out on the job, particularly if it is on a breakdown, that very often the devices are not exactly what they intended to be and he makes a bit of a "Heath Robinson contraption".

According to the sketches in the paper it would appear the Mr Doone's Company's new generation of arrestors have, what I call the "bolt" type terminations, which are designed for lugged conductors for the final connection. Are conductor "clamp" type not favoured for some specific reason?

Many supply engineers favour the use of arrestors which incorporate an automatic disconnection device on the ground connection; would he care to comment on this aspect please?

And it would be interesting to hear his views on the cost effectiveness of arrestors on, say, a typical 11 kV network. I know

many colleagues feel and say that it isn't economic sense to protect a small pole mounted transformer, when poor site conditions for example, and poor installation practices, probably leave that very item as vulnerable after the installation as it was before the installation.

Mr Doone's paper, and his answers to the items which I am sure will be raised in the discussion, will make a useful contribution and reference to our proceedings and I thank him very sincerely for this and for his presence here today. Thank you Mister President.

#### MR GELDENHUYS: NEERI

Meneer die President baie dankie vir die geleentheid ek waardeer dit.

Mr President metal oxide arrestors, I believe, are the arrestors that we are going to see on our systems in the future. They are already today the arrestors of EHV and HV systems and through optimised housing techniques and better optimised production techniques of the MOV material itself. I believe in the very near future the price will reduce to such an extent that these arrestors will be cost effective at distribution level and at reticulation voltage levels.

Mr President please allow me to share with you a little bit of our experience with arrestors on our 11 kV test line. Many of you may know that the NEERI and Eskom are jointly operating the 11 kV test line, specifically with the purpose of investigating the effect of lightning on distribution lines, and if you will allow me I would like to show you a few slides on this work.

- 1) Line construction
- 2) Station measuring
- 3) Middle measuring station
- 4) The measurement configuration
- 5) Recording equipment
- 6) An example flash
- 7) An MOV arrester reaction to this flash

I would like to conclude by telling you why this arrester failed. Interestingly enough this arrester failed due to the particularly low earth resistance of the pole at which it was installed. I will briefly explain: The earth resistance vary greatly therefore one finds that strikes to the neighbouring line tends to be dissipated not at adjacent arrestors but at this particular spot on the line.

#### MR FRED DANIEL: CAPE TOWN

Mr Doone I would like to compliment you on your paper. In most papers on Surge Arrestors, everybody seems to shirk away from the point of pollution. We in Cape Town have had a lot of trouble with pollution and failures of surge arrestors under dry climatic conditions because of pollution, and I wonder if you could give us some information along this aspect, and in particular corrosion which is quite prevalent in the Cape. Thank you.

#### MR RODGER MARTIN: AFFILIATE

I would like to congratulate Mr Doone on an interesting paper on Distribution Class Surge Arrestors. While generally accepted that moisture ingress is one of the larger causes of arrester failure, the percentage of failures due to moisture ingress varies considerably, according to different studies made.

For example studies show moisture ingress to account for approximately 50% of arrester failures. Another interesting fact was that the failure rate on so called 5 kilo-amp arrestors was found to be considerably less than on 10 kilo-amp arrestors.

With regard to the ceiling system used, most distribution type surge arrestors used a nitra-rubber-seal and in some cases this is loaded by bellville wacker. Today, I believe no International Standards incorporate a 100% test on the ceiling system.

I understand there is a move in the USA to incorporate a 100% vacuum time leak test on distribution class surge arrestors. Certain manufacturers do a 100% vacuum leak test on arrestors already. Could Mr Doone please comment on what type of leak tests are done on the type CSTD surge arrester?

With regard to the short circuit test we were shown by Mr Doone, these were done on arrestors which naturally were not fitted with automatic ground leak disconnectors. In practice most arrestors used in South Africa are fitted with automatic ground leak disconnectors as this makes finding a fault at arrestors far quicker and easier. In addition if an arrestor should fail, the automatic ground leak disconnector would disconnect the arrestor from ground before violent failure occurred.

With regard to fitting automatic ground leak disconnectors, I wonder if Mr Doone could comment on the use of an automatic ground leak disconnector on the Type E Series surge arrester. I note that the mounting bracket grips the arrester at the bottom metal housing and would a separate insulating bracket have to be used if an automatic disconnector is fitted to this arrester.

With regard to the standards for metal oxide arrestors, I understand that at present the IEC standard will still be approximately 18 months before it is finalised. The American IEEE standard for metal oxide surge arrestors has recently been published. However, there are several differences in the standard compared to the IEC draft document. Could Mr Doone comment on some of the main differences in these two standards? Thank you Mister President.

#### MR ROD DOONE:

Mr President, first of all let me comment on Mr Max Clarke's contribution which, I think was excellent, in that he identified that a lot of problems associated with surge arrestors are in fact peripheral factors. Very little to do with the surge arrester. This is where I believe, the manufacturer has the onus on him to keep very close contact with his customer. Because it is essential to ensure the good performance of your product, that it is correctly installed, and in a manner in which it will not give problems.

Mr Clarke referred to the Ontario Hydro analysis, where moisture ingress was identified to be the major cause of surge arrester failures. First of all lets get the failure rate into perspective. It was probably less than 1% of all lightning arrestors installed, so it is still a very small amount. But the people at the Ontario Hydro had considered peripheral factors, they had considered other problems such as earthing and if you'd like to take up the references given in the back of my paper and contact Ontario Hydro, I am sure you will find that they sincerely believed that at that time, moisture ingress was their major problem. Ontario Hydro being a large authority has laid down installation procedures, so a large amount of the peripheral factors were reduced.

Mr Clarke also commented on earth resistance, and I think this point was largely addressed by Henry Geldenhuys during his presentation. Clearly if you got poor earthing, you're arrestors are going to be passengers at the point where the poor earthing exists.

Mr Clarke also commented on the poor connection of the arrester, the 'E' Range, could it not be provided with a clamp type and also could it not be supplied with a disconnect device. The answer to both questions is yes. Whether you use a disconnect device or not, I think, largely depends on your system and supervision and a number of other factors.

The disconnect device was introduced, to my mind, as the poor man's alternative to a pressure relief device. Certainly if the surge arrester goes faulty, commencing with a current which is somewhere in the order of its power follow time, which in a silicone carbide arrester is up to about a 100 amps peak, then a disconnect device will operate and give you a visual indication that your arrester has failed. The 'E' Range can be provided with this facility, either by the supplying of an insulated bracket or the disconnect device can be connected in the line side with little difficulty.

The problem with the disconnect device, whether it is of the explosive version as we use, or whether it is the fuse wire spring return type, is that it is incapable of clearing fault currents where the voltage is much over 11kV.

We did a series of tests on several manufacturers' disconnect devices and found that the limits of clearance at 12 kV was round about 2 kA at the best. OK if the system short circuit current

does not rise much above 2 kA and a disconnect device may save you from shattering. What we have to bear in mind is that the mechanism of surge arrester failure can be instantly catastrophic, not a slow build up of current as elements is consumed, and work is being carried out to show that with metal oxide surge arrestors there is very little chance of there being a slow growth in current. The follow current in a metal oxide arrester is in milli-amps. If it fails, milli-amps will jump to short circuit currents in a matter of a few micro-seconds. So therefore a disconnect device in our opinion is virtually useless.

I think the most interesting point raised by Mr Max Clarke was the cost effective side of surge arrester installation, and I think as a manufacturer, I do not feel competent to comment to deeply on this. But in developing the 'E' Series this was done in careful co-operation with a number of large power companies. The aim was to reduce the total cost of a terminal pole. That, we have truly achieved. Countries like Norway have virtually adopted this system 100% and are saving themselves very large costs at each new terminal pole.

I would now like to turn to the presentation by Henry Geldenhuys. What can I say? As I say in my main paper, if it wasn't for the published information that is provided by NEERI and CSIR, manufacturers such as myself would be ten years backwards. The work done here in South Africa leads the world in the study and behaviour of lightning on power systems.

Henry emphasised that installation practice, including earthing is as important an item as the arrester itself, and I can only agree with that. Henry also raised the interesting subject of what is the gas generated in our arrester. I must assure anybody who is concerned that, that gas has been analysed and it is basically free carbon and CO<sub>2</sub>. Relatively harmless. The carbon in fact gives the power arc conduction. Without the free carbon there is a chance that the arc would extinguish and the arrester would be in real problems then.

Mr Fred Daniel raised a topic with which I am very closely involved, particularly with higher voltage arrestors. What happens under pollution, particularly with metal oxide? When metal oxide came on the scene, some 12, 15 years ago, every paper that was produced on this subject, mainly by manufacturers, said this was the end of our pollution problems with surge arrestors, we have now eliminated the gap, we now have surge arrestors which can withstand pollution.

I can tell you from work that I am doing with three research organisations that, that wish is totally unfounded and that metal oxide surge arrestors do fail under pollution conditions. The mechanism of failure is very interesting and I will very briefly give you an outline. This mainly applies to high voltage arrestors, but it has also occurred in low voltage or medium voltage distribution arrestors.

Most surge arrestors of the porcelain type have an air gap between the metal oxide elements and the internal wall of the porcelain housing. If pollution becomes so extensive that the unusual phenomena of dry banding occurs, at the point where the dry banding occurs, the air gap within the arrester starts to ionise. When it ionises the arrester gas becomes contaminated and this has a damaging effect on some metal oxide arrestors. Generally speaking there is a catastrophic failure.

Mr Rodger Martin of Eberhardt Martin made some very interesting comments and he obviously had noted that the percentage of moisture failures depends on who made the study. I would add it also depends on the manufacturer. 5 kA performing better than 10 kA, I would say that also depends on the manufacturer.

Steaming is of course an important technique and so as not to overrun too far, all I can say to Mr Martin is, that I am secretary of Working Group 5, which is currently formulating a standard on the mechanical requirements for surge arrestors, and steaming is one of the topics which is under close scrutiny.

The CSTD arrester he referred to has been put through a number of leak tests and as far as we are concerned, we are satisfied. I have said all I have time to say on the automatic ground leak disconnect device. If you want it with the 'E' Series, you

can certainly have it, but I think you must question your motives as to why you've got it. The 'E' Range when it fails, gives a nice visual indication that it is no longer operative, it turns black as samples on the Bowthorpe-Hellermann Deutch stand show.

Finally the Standard, I think you are a little bit misinformed Mr Martin, as to the state of the IEC standard. As far as I am concerned the last draft document has been passed on to the six

months rule and will probably be in operation within the next six months.

As far as I am concerned it is the only standard, I only work to International Standards. I believe that it is the work of an international body which is taken into all considerations. I am not prepared to comment on individual Standards from other Countries. Thank you.

## COST REDUCTIONS IN POWER TRANSFORMERS AND MINIATURE SUBSTATIONS

J C van Alphen Pr Eng and B A Jansen



J.C. van Alphen



B.A. Jansen

### 1. INTRODUCTION

#### 1.1 The transformer market and its place in the distribution industry

Power transformers, distribution transformers and miniature substations form a major cost component in urban power distribution networks, absorbing some 20% of the capital investment.

The total transformer market in South Africa amounts to an annual production of approximately R140 million, broadly distributed over the following categories:

- Category 1: transformers over 40 MVA and over 132 kV - R40 million,
- Category 2: power transformers up to 40 MVA and 132 kV - R30 million,
- Category 3: distribution transformers - R40 million, and
- Category 4: miniature substations - R30 million.

#### 1.2 The South African manufacturing industry and its clients

South Africa is fortunate in that the national transformer industry can manufacture all transformers with voltage ratings of up to 400 kV and with power ratings of up to 800 MVA. The industry comprises the following manufacturers:

- Category 1: one manufacturer,
- Category 2: four manufacturers,
- Category 3: ten SABS permit holding manufacturers,
- Category 4: eight SABS permit holding manufacturers.

The main purchasers, rated in percentages of quantities purchased, are:

#### 1.3 Reduction in transformer cost

Some methods of cost reduction e.g. accepting a de-

TABLE 1

	Municipal utilities	Escom	Mining companies	Industrial & commercial
Category 1	10 %	90 %		
Category 2	25 %	60 %	5 %	10 %
Category 3	20 %	40 %	10 %	30 %
Category 4	50 %	10 %	10 %	30 %

crease in the basic insulation level of the transformer, an increase in transformer losses, an increase in transformer impedance, a higher temperature rise limit for the transformer or simply a transformer of a less robust mechanical construction, would result in a lowering of the standard of transformer performance. These measures are not likely to be cost effective in the power distribution environment.

Costs can, however, be reduced by the reduction of marketing cost, of design cost, of procurement cost and of manufacturing cost as a result of the reduction of product variety, as has been shown in many overseas utilities.

#### 1.4 Standardization and the role of the SABS

The authors would recommend that standardization of transformers be improved, since standardization could lead to simplification and to the reduction of unnecessary variety. In such a case, the ultimate benefits would be substantial.

The majority of people will readily accept the positive benefits of good standards properly applied, but there may well be reservation from certain sections of the in-

dustry about some particular aspect of standardization or about the degree to which standardization is desirable in any particular case. What is beneficial to the manufacturer in effecting savings of materials or labour may be marginally detrimental to the customer in restricting his choice of size, quality or style, although both will benefit from the considerable lowering of cost.

Before initiating any standardization activity, therefore, the economic effects should be examined and the limits to which standardization may be carried and still be cost effective should be determined. It is indeed difficult and some people may say impossible to arrive at a solution to such a complex problem; and yet, similar problems have been successfully tackled before.

An example is SABS 780, the standard specification for distribution transformers. When this specification was first prepared in 1965, it was considered almost impossible to standardize such a complex commodity. Today this specification enjoys universal acceptance and the transformers produced in 1985 were marketed at 40% of the 1965 prices in real terms. In accordance with the ISO Publication "The aims and principles of standardization", the authors believe that no exact answers to engineering choices are needed. A reliable approximation, backed by statistical data and empirical rules, is all that is usually necessary for practical engineering standards.

One might ask what the role of the South African Bureau of Standards would be in this matter. Preparing standard specifications is a major function of the SABS and in this case, SABS involvement could be decidedly advantageous. Firstly, there is the advantage that an SABS standard is supported by a technical committee representing the expertise available in South Africa, thus ensuring the technical integrity of such a standard. Secondly, a national standard is continually being challenged by manufacturers and users alike to keep abreast of technical and economical developments in the industry, something rarely experienced with private specifications of purchasers.

#### 1.5 The scope of this Paper.

The authors propose to explore the possibilities for the establishment of a national standard for medium size power transformers and a new national standard for miniature substations to replace the existing SABS 1030.

The cost effectiveness of the main parameters involved in such standards will be examined.

Finally, this paper serves to demonstrate that significant cost benefits can be achieved by adopting practical parameters, which represent certain operational compromises.

#### Bestek van hierdie referaat.

Die outeurs beoog om die moontlikheid te ondersoek om 'n nasionale standaard vir middelgroot kragtransformators en 'n nuwe nasionale standaard vir miniatur substasies, wat die bestaande SABS 1030 sal vervang, daar te stel.

Die koste-implikasies van die hoofparameters wat by sulke standarde betrokke is, sal ondersoek word.

Laastens dien hierdie referaat as aanduiding dat beduidende kostebesparings behaal kan word deur praktiese parameters, wat sekere bedryfskompromisse inhoud, aan te neem.

## VARIABLES IN POWER TRANSFORMERS

### 2.1 General considerations

The general performance requirements for transformers have been laid down internationally and are reflected in IEC Publication 76 of 1976. South Africa, as a member of the IEC, is committed to incorporate these requirements in any South African standard specification for the purposes of international trade.

IEC specifications set performance standards, whereas the national specifications set further standards in respect of ratings, voltages, impedances, fittings, etc. In South Africa the transformer specification with the

widest application is undoubtedly Escom specification DCS 1532. This specification has resulted in a significant measure of standardization in the power transformer market. It is proposed that this document be used as a basis for a national standard.

In the following subsections of this paper some of the requirements of DCS 1532, which the authors believe need to be scrutinized or challenged in terms of today's economic climate, shall be discussed.

### 2.2 Transformer ratings and voltages

The greatest need for standardization and reduction of variety exists in that segment of the market indicated by category 2 of Table 1, which is serviced by 4 manufacturers and has a considerable spread of users.

The proposed standard specification should perhaps cover a range of transformers starting at the upper limit of the ratings covered by SABS 780 and reaching up to a voltage level of 132 kV and a power rating of 40 MVA. Such a standard would exclude special transformers like furnace transformers, locomotive transformers, etc.

### 2.3 Physical dimensions

In the operation of a distribution network the replacement of power transformers is a regular necessity. However, due to the lack of standardization of overall dimensions, position of bushings and cable boxes etc., the replacement of failed transformers can present a major difficulty and have disruptive effects on the consumers.

The civil design of substation buildings is frequently completed before an order is placed for the transformers. This means that a substation can either be over-designed or, alternatively, the civil design might impose physical limitations on the transformer design. To overcome these and other problems, it would be useful to include some maximum overall dimensions in the specification.

### 2.4 Impedance performance over the tapping range

In the evaluation of the requirements of impedance variation of a transformer over its tapping range, there are two schools of thought, namely one advocating *constant percentage impedance performance*, which is the conventional approach and one advocating *constant ohmic impedance performance*, which is the approach adopted by Escom.

The concept of constant ohmic impedance performance holds the following advantages and disadvantages:

#### Advantages

- The fault level of the low voltage system is independent of the position of the tapchanger.
- The ohmic impedance of such a transformer is practically a constant and can be stored in a central data base for processing purposes. This has certain advantages in a large interconnected power system (IPS) in which the flow of MVAR is closely monitored.

#### Disadvantages

- The transformer is more expensive.
- Its dielectric integrity is more difficult to achieve.
- This principle is a South African novelty and is not applied anywhere else in the world.

This summary of the advantages and disadvantages of the concept is explained below.

A conventional core and winding structure, with the low voltage winding against the core followed by the high voltage winding followed by the tapping winding, yields a constant percentage impedance performance over the tapping range.

The constant ohmic impedance performance, however, is achieved by positioning the tapping winding directly against the core, followed by the low voltage winding, and positioning the high voltage winding on the outside of the winding assembly.



As the tapping winding is essentially a high voltage winding, this last method of construction implies that an extra high to low voltage insulation gap is introduced radially. This in turn means that the radii of the low and high voltage windings are increased by the radial thickness of the tapping winding and the two high to low voltage gaps, increasing the copper content of the transformer and increasing the leg pitch of the core. Both these phenomena have disproportionate implications for the cost of power transformers, affecting the smaller units, such as the range from 5-40 MVA especially.

The dielectric integrity of the transformer is affected by the necessity to bring 8 to 16 sets of tapping leads out from the innermost winding, directing them over the low voltage winding to the front of the high voltage winding. This comparatively complicated construction method could introduce potentially weak spots between the tapping leads and the core and between the tapping leads and the low voltage winding. It could also mean an increase in the leg height of the core to create the necessary clearance space for these tapleads.

Depending on the size of the transformer and the manufacturing method employed, the cost increase for this construction method is in the order of 5-10% on the price of the transformer. This expenditure would have to be justified in terms of the benefits gained.

The benefit of having predictable impedance values for central processing purposes is of very limited value for the substation type of transformer under discussion.

The constant fault level of the medium voltage system is again of limited value for the system applications in municipal networks. Where low voltage conditions are mostly caused by non-availability of plant, with a consequent increase in source impedance, natural compensation is provided by the system for the decrease in transformer impedance at the higher tapplings. It is appreciated that low voltage conditions are sometimes also caused by pressure of demand, but that condition applies mostly to systems planned with insufficient foresight.

In conclusion, adopting the constant ohmic impedance performance concept for a national standard specification for power transformers does not seem to be cost-effective.

## 2.5 Losses and loss capitalization

If a reasonable measure of standardization is to be achieved, the pattern of losses must be defined. This can be achieved by the provision of a table of standard losses, a method preferred by some manufacturers and by many users. However, the adoption of this method may be an over-simplification of the issue.

An important contribution in the field of engineering economics has been made by Mr DC Palser, in his paper "An introduction to engineering economics", read to the 1981 AMEU Convention in Durban. He stressed the significance of appropriate parameters for the evaluation of losses in electrical distribution networks, and favoured the use of capitalization formulae. This matter needs further scrutiny in respect of the selection of variables and the effect this might have on transformer design.

Where capitalization formulae are applied in adjudication of contracts, it is evident that the transformer designer must optimize the sum of the cost of the transformer and the capitalized value of its losses. This means that the transformers under a particular contract have a unique arrangement of load and no-load losses for any particular capitalization formula. There are unfortunately as many capitalization formulae as there are transformer contracts and this leads to a great variety of designs for the same transformer. This forms an obstacle in achieving standardization.

A typical capitalization formula could be represented by:

$$V = P + C_0 \cdot L_0 + C_1 \cdot L_1$$

where

$V$  = transformer capitalized value, Rands

$P$  = transformer contract price, Rands

$C_0$  = capitalized value of no-load loss, Rands/kWh

$L_0$  = no-load loss of the transformer, kW

$C_1$  = capitalized value of load loss, Rands/kWh

$L_1$  = load loss of the transformer, kW

Some of the theoretical considerations resulting in the development of the under-mentioned capitalization formulae are explained by Mr DC Palser.

The capitalized value of the no-load loss may be represented by

$$C_0 = \frac{(1+i)^n - 1}{(1+i)^n} \cdot i \cdot (M \cdot 12 + E \cdot T); \text{ and}$$

the capitalized value of the load loss may be represented by

$$C_1 = \frac{(1+i)^n - 1}{(1+i)^n} \cdot i \cdot (g \cdot K)^2 \cdot [M \cdot 12 + E \cdot T]$$

where

$n$  = projected commercial life of the transformer, years

$i$  = projected interest rate in real terms during the life of the transformer, decimals

$M$  = monthly maximum demand charge, Rands/kWh

$E$  = electricity charge, Rands/kWh

$T$  = total time that the transformer is connected per annum, hours

$L$  = load factor for the system or transformer

$K$  = rating utilization factor for the transformer

$k$  = loadcurve form factor

$g$  = factor representing the annual load growth

Since the first five parameters are common to the formulae for no load and load loss capitalization, they affect the level of the losses, whereas the last four parameters affect the distribution of the losses between the no-load and load losses. Both sets of parameters have a significant effect on the transformer design and both can have considerable cost implications.

Figure 1 illustrates the effect of four different capitalization periods, ranging from 15 to 30 years, as well as the effect of the interest rate on the annuity value and therefore on the capitalized level of the losses.

As far as the projected commercial life  $n$  is concerned, transformers designed in accordance with an effective capitalization formula in a well-planned system of an electrical utility could have a commercial life of up to 30 years.

The single factor with the most significant cost implications is the interest rate  $i$ . When the effective average interest rate over the commercial life of the transformer is being selected, the difference of the interest rate over the annual inflation rate should actually be considered.

It is important to take a long-term view of all parameters. The fact that electricity tariffs are at the moment not rising as sharply as the inflation rate might have no influence on our long-term projections of the interest rate in real terms. Similarly, the cost of capital to a utility might not be equal to the prime interest rate. There is, however, a long-term relationship between the cost of utility capital and the electricity tariff and this difference is very close to the growth rate of the economy.

Recent studies carried out by Dr Burg van der Walt and Dr Sarel van der Walt of the Economy Division of the South African Reserve Bank indicate that the interest rate in real terms, which normally equals the economic growth rate, projected over the next 20 years, could be expected to be 3% per annum.



An effective interest rate of 3,0% could therefore be adopted, which would ensure that transformers are produced with sufficiently low losses to be efficient and cost effective.

Where the tariff is usually not a matter of choice, there is not much point in investigating loss level variability as a result of tariff variation, although it can be noted that the relationship is entirely a proportional one.

The factor  $T$  is usually calculated on the continuous use of the transformer and amounts to  $24 \times 365 = 8760$  hours.

When the effect of the factors affecting loss distribution is being studied, Figure 2 may be used as a guide. This graph illustrates that the load division factor  $k$  causes loss value variation in the range of 6100-7300 which is a variation of 20% the load factor  $l$  of the load causes variations in the range of 3100-7000, with a variation of 120%, and the rating usage factor  $K$  has a loss value in the range of 0-6100 Rands/kW.

It is obvious that the selection of a value for  $k$  is not critical for our purposes and a value of 0,3 is considered a good average for the most common load curves.

The load factor  $L$  varies by 60% over the most practical range of 0,2-0,8 and we believe that the average value of  $L = 0,5$  is a good estimate for the purpose of transformer design parameters.

With respect to the variable  $K$ , there are two basic approaches, one based on a 100% standby capacity ( $K = 0,5$ ) and a second one based on no calculated standby capacity ( $K = 1,0$ ). Because of the large variation of loss values, the authors believe it is necessary to provide both for  $K = 0,5$ , for most utility applications, and for  $K = 1,0$ , for certain industrial and special applications.

The load growth factor  $g$  can be calculated by integrating the area under the load growth curve and varies in value from 0,78-0,94 for growth rates from 3-10% per annum, respectively. A value of 0,90, corresponding to a growth rate of 7,0% p.a., as a figure representing most utility environments, would appear to be a good estimate.

To summarize, it would appear that the following capitalization formula should be considered for inclusion in a national standard:

$$V_1 = P + 8000 \cdot L_0 + 900 \cdot L_1$$

This is intended for applications with 50% calculated standby and  $K = 0,5$ .

For those special applications where no standby capacity is required, the undermentioned formula for  $K = 1,0$  could also be included:

$$V_2 = P + 8000 \cdot L_0 + 3600 \cdot L_1$$

## THE NATIONAL STANDARD FOR POWER TRANSFORMERS

### 3.1 Synopsis of the proposed standard specification

The proposed standard specification would be aimed at the ratings mostly used by the municipal undertakings and by the regional undertakings of Escom, i.e. 2,5-40 MVA and system voltages of up to 132 kV.

The standard specification should provide, apart from the requirements of IEC Publication 76, requirements for

- standard power ratings,
- standard winding impedances and impedance performance,
- standard capitalization formulae for loss evaluation,
- standard maximum overall dimensions,
- general constructional features,
- standard fittings,

- standard positioning of terminal gear, marshalling box, tapchanger and oil handling gear.

Such a standard would yield substantial direct cost benefits owing to reduction of variety.

There are, however, also less tangible cost benefits. As this standard specification is expected to meet the requirements of the majority of the South African users, the purchase specifications for power transformers should be simplified considerably. If this standard specification finds acceptance, the replacement of transformers in case of failure or uprating would also be facilitated.

Although the standard specification can not be expected to suit all applications, it will be aimed at satisfying the needs of a large section of the medium size power transformer market. In special applications where this standard specification would not be applicable, it could still be used as a basis for a private specification.

## 4. VARIABLES IN MINIATURE SUBSTATIONS

### 4.1 General considerations

In an effort to standardize miniature substations and facilitate the exchange of transformer units and compartments, SABS 1029 was published in 1975. It covers the basic construction methods of a miniature substation with detachable MV and LV cubicles, as well as the safety aspects of these structures, protecting the public against inadvertent contact with live apparatus.

The slender type of miniature substation was thought to be the most popular and SABS 1030 was therefore prepared to cover dimensional standards for this type of miniature substation.

It is proposed to revise SABS 1029 in order to eliminate most of the design restrictions related to the method of construction. In an effort to concentrate on affordable engineering standards it is proposed to withdraw SABS 1030 and re-issue it in autonomous parts, each dealing with a particular type of miniature substation from the most elementary to the types providing MV and LV switching devices.

At this stage there seems to be no identified need to cover the more elaborate miniature substations.

### 4.2 Ratings, voltages and tappings

The new standard specification should provide for miniature substation transformer ratings of 100, 200, 315, 500 and 630 kVA. With the increased use of 22 kV as a reticulation voltage, we believe that the standard specification should cover system voltages of 6,6, 11 and 22 kV on the medium voltage side.

Contrary to traditional practice SABS 1029 states that transformers need not be provided with tapswitches. In view of the fact that most miniature substations are used in an urban or suburban environment with a fairly strong electrical infrastructure, it is considered cost effective to reinforce this requirement.

### 4.3 Constructional requirements

One of the original requirements was that the transformer and the MV and LV compartments should be separate units to facilitate the replacement of the transformer in case of failure or uprating.

After some 15 years of operational experience, it now seems that this constructional approach is no longer justified. The transformers have proved to be most reliable and in the few cases that transformers had to be removed, the entire miniature substation was replaced.

It would seem more practical and cost effective to design the miniature substation as a single fabricated unit, more or less along the lines of a mining miniature substation. The requirement for a separate, galvanized, epoxy-tar coated base should also be dispensed with

under these circumstances. This arrangement should lead to a more robust structure and will leave the manufacturers free to produce the most cost-effective design.

The proposed new SABS 1030 should set basic physical dimensions for the various types of miniature substations. This would allow the users to develop standard pre-cast concrete plinths and it would facilitate the exchange of miniature substations for operational reasons.

#### 4.4 Requirements for the MV compartment

The MV compartment was initially intended to provide for the termination of an incoming MV cable. Later a second cable was added to provide for a ring feed system, followed by the addition of an elementary ring main unit of the Magnefix type with a fused T-off. This development was followed by the provision of an oil-filled ring main unit with compound- or air-filled cable boxes on either side, requiring a much larger MV compartment.

In a recent development, a miniature substation, with an additional measuring transformer compartment on the MV side, housing a set of 11 kV VT's and CT's, presumably for 11 kV protection equipment, was used.

It is clear that all these developments have led to a miniature substation of greater technical excellence and versatility, but at the same time they have caused more diversity in the manufacturing process and they have caused the price to increase sharply. If these standards of excellence are to be applied for the provision of infrastructure for future urban developments, the cost per stand would soon rise beyond the means of most of the potential residents.

Some miniature substations are required for commercial projects, where the price of floor space is so high that it becomes an important factor in the consideration of miniature substations.

To explore fully the potential for cost reductions in miniature substations, the fittings specified would obviously have to be economized. Some practical arrangements for the MV compartment for typical utility applications are specified below.

##### Two cable terminations and two sets of links.

This arrangement comprises an incoming and an outgoing cable termination with a set of links connecting them, closing the ring supply, and with a set of links to the transformer terminals. This arrangement is particularly suitable for underground MV cable networks. The feeding MV rings typically comprise five to ten miniature substations, each supplying some 20 dwellings. Protection for the miniature substation and the cable network is provided at the feeding substation, where all switching is done. The concept is simple, reliable and cost-effective, particularly since it lends itself to the application of the slender Type A miniature substation.

##### Two load break/fault make switches

An arrangement providing switching facilities would comprise two load break/fault make switches, one for each incoming cable circuit, and a direct centre connection to the transformer terminals. Where this arrangement allows for the necessary switching to be performed at the affected miniature substation, the system can cope with the fault incidence of exposed installations. It could therefore be used with underground cable, aerial bundle conductor or overhead line networks. This equipment could conceivably be fitted into the slender type miniature substation.

##### The ring main unit with or without a fused T-off

This system provides for switching of the ring as well as for protection of the transformer circuit by fuses in the T-off.

The most significant difference between this system and

the previous one is that the ring main unit provides a switching facility for the transformer and, in the case of a fused T-off, also fuse protection for the transformer. Transformers manufactured under the Mark Scheme according to SABS 780 are very reliable, and the question could arise whether the additional expense of switching and protection facilities for each transformer in a ring supply system is justified.

This arrangement can be provided with epoxy encapsulated switchgear which would still fit into the slender type of miniature substation. However, if oil- or gas-insulated switchgear is specified, the wider type of miniature substation would have to be used, making the unit more expensive and taking up more space on the sidewalk.

Eventually all operating conditions can be accommodated with the above-mentioned three options of MV switchgear.

#### 4.5 Requirements for the LV compartment

It is not only the options of the MV compartment that could be standardized to reduce costs, however. The requirements for the LV compartment could also bear re-examination and are therefore discussed below.

##### Provision of fuse pillars or fuse racks

This is certainly the simplest way of providing protected outgoing cable circuits for the LV network. Usually four fuse pillars are provided that could supply three kiosks, feeding six dwellings each, as well as street lighting. No provision has been made for LV metering, nor for any LV switching, although fuses can be drawn on load. The advantage of fuse protection on single phase supplies is that an outage is mostly confined to the consumers on one phase only.

##### Provision of moulded case circuit breakers

The provision of a main circuit-breaker should be considered first of all. Providing a 500 A MCB for a 315 kVA unit is costly and it yields little in the way of benefits if MCB's are provided on the outgoing circuits. Four circuit-breakers of 125 A could be provided for the outgoing cables. Where the LV compartments equipped with MCB's are usually designed on the dead-front principle, load indicators fed from CT's are normally provided. These compartments are significantly more expensive than the fuse pillar type.

##### Provision of additional circuitry

Consideration should be given to the desirability of the fitting of street lighting circuits, energy measuring devices and protective equipment.

Street lighting circuits are usually not extensive and would normally not lead to the enlargement of the compartment. It might however, be more practical to fit a standard circuit board in a miniature substation after delivery. This facilitates standardization and reduces the amount of bought-out equipment to be fitted by the manufacturer.

It might not be very practical to fit energy measuring devices in the miniature substation, since this would entail some 18 kWh meters in a typical 315 kVA unit. It would furthermore require longer consumer cables than if the distribution kiosk system were used. There would most likely be a cost increase if this concept were to be applied.

The provision of MV or elaborate LV protection equipment would probably not be justified for the normal residential supply miniature substation. The incidence of faults in cable-connected networks is so low that one cannot commit money to systems to deal with these few faults.

Considering all this, it would appear to be most cost-effective if SABS 1030 were to call for the provision of a standard frame in the LV compartment of each type of

miniature substation. This frame could then accommodate an LV board purchased by the user, either from the miniature substation manufacturer or from a manufacturer of control panels.

This arrangement relieves the transformer manufacturer from the necessity of manufacturing relatively complicated switching panels, for which these manufacturers are often not suitably equipped. An annexure to the proposed SABS 1030 could outline some simple LV protection options, like a panel with four to six fuse pillars or MCB's, which would be readily supplied by the transformer manufacturer.

## 5. THE NATIONAL STANDARD FOR MINIATURE SUBSTATIONS

### 5.1 Synopsis of the proposed standard specification

As mentioned in 4.1, it is envisaged that the present SABS 1030 be withdrawn and be replaced by an entirely new standard specification, issued in three separate parts, each one covering a particular miniature substation design.

The first one would cover the most economic design, with two cable terminations and two sets of links in the MV compartment.

The second one would provide for switching of the MV ring by means of two load break/fault make links in the MV compartment.

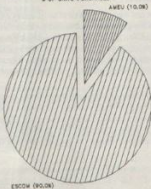
The third one would require a ring main unit to be fitted in the MV compartment, providing for switching of the ring as well as the transformer feeder.

The first two designs would be based on the slender type A miniature substation, whereas the last design would be of a slightly wider box design of type B. The first two enclosures would provide a single standard low voltage compartment with a standard frame for protection equipment. The third enclosure would have, in addition to the standard low voltage compartment, a second low voltage compartment in front of the transformer tank. This compartment would have its own standard frame for additional control, protection or measuring equipment.

The need for the above-mentioned miniature substation concepts was established by country-wide consultations with manufacturers, electrical utilities and consulting engineers.

The investigations have led to the conclusion that the proposed range of designs will satisfy the majority of the market. It will lead to a greater measure of standardization in the transformer industry and will still allow the necessary freedom in the provision of protection and control equipment.

LARGE POWER TRANSFORMER USERS  
% OF UNITS PURCHASED



## 6. THE FUTURE OF COST-EFFECTIVE POWER DISTRIBUTION

Modern technology has led to new developments in the fields of cables, switchgear, protection and other equipment. Commodities like aerial bundle conductors, gas-insulated switchgear and phase-2 solidstate protection hold exciting prospects for cost reductions in the field of power distribution.

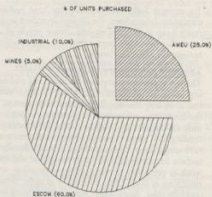
In the field of transformer technology, however, the future could be equally exciting with great prospects for significant cost reductions.

Various options towards more cost-effective power transformers and miniature substations have been outlined in this paper. Standardization plays an important role in effecting cost reductions. This paper has indicated that standard parameters can be defined which influence critical quantities in the design of power transformers. The intention was not to be prescriptive in the selection of these parameters, but rather to demonstrate that standards can be defined for widely divergent variables if these variables are critically examined from a practical point of view.

The concept of miniature substations needs a critical re-appraisal. New technology will have to be evaluated for incorporation into the concept to achieve the cost reductions needed in these times of economic depression. We have outlined three proposals for standard miniature substations, perceived to represent the majority of utility needs and allowing the manufacturing industry to rationalize its production.

If the standards for power transformers and miniature substations can be developed and introduced, substantial cost benefits will be introduced in the field of power distribution.

MEDIUM POWER TRANSFORMER USERS

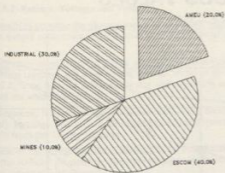


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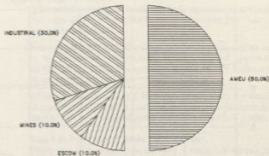
### DISTRIBUTION TRANSFORMER USERS

% OF UNITS PURCHASED



### MINIATURE SUBSTATION USERS

% OF UNITS PURCHASED



## CAPITALIZATION FACTOR

for a fixed lifespan in Rands/Rand loss

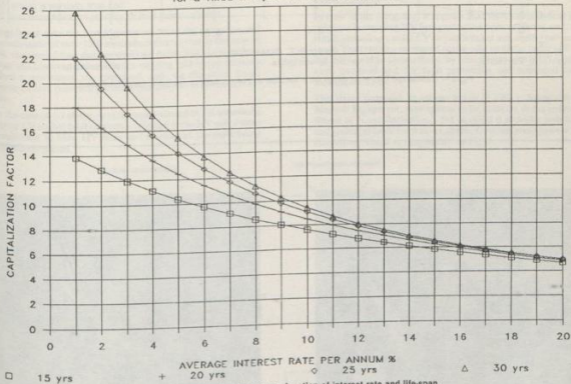


Fig. 1 — Capitalization factor as a function of interest rate and life-span.

## CAPITALIZED LOAD LOSS VALUES

$T=A$ ;  $n=30$ ;  $k=0,3$ ;  $L=0,85$ ;  $K=1$ ;  $i=0,03$

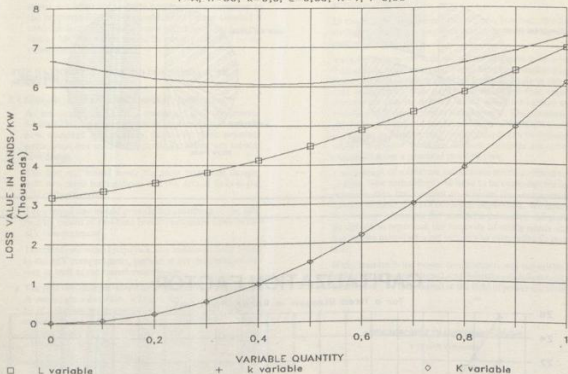


Fig. 2 — Capitalized load loss values as a function of various factors related to loss distribution.



Mr Ray Neale: General Manager, Distribution Transformers, ASEA, contributing to the paper on "Cost Savings In Power Transformers And Miniature Substations".



Mr NL (Nobby) Adams, Director, Power Engineers, contributing to the paper on "Cost Savings In Power Transformers And Miniature Substations".



## V A RAYNAL: AFFILIATE

The authors are to be congratulated on presenting a most important paper as far as cost effective distribution is concerned.

I wish to confine my comments to Minisubs.

### Item 4.2: Ratings, Voltages and Tappings

The authors propose the elimination of tap switches which, as far as supply authorities are concerned, is not a popular proposal.

Transformer manufacturers advise that the additional cost of providing tappings and a tap switch is of the order of an additional 2% on the cost of a transformer and about 1% on the cost of the whole minisub.

Furthermore, it appears that practically all AMEU customers specify tappings and orders for non-tapped transformers are mainly from the Mining Industry.

In view of the foregoing, there appears to be little likelihood that the authors' proposal to eliminate tappings in distribution transformers will be generally accepted.

### Item 4.4: Use of HV Links

There is considerable merit in the authors' proposal that HV fuse protection of minisub transformers be eliminated.

It has been assumed that HV fuses will

- clear HV connection and transformer HV winding faults
- protect the transformer against overload
- clear LV winding and busbar faults.

It is accepted that

- above is true, and because the failure rate of SABS 780 transformers is so low, the use of HV fuses is not really justified.
- above is partially true and
- has been found in practice to be a misconception.

Experience over the past 15 years involving the operation and maintenance of over 1500 minisubs indicates that in the case of (b), the size of fuse dictates overload protection. Low-current fuses can however cause nuisance tripping with inrush currents when transformers are energised, and, on the other hand, heavy-current fuses will provide practically no overload protection.

In the case of (c) above, several cases occurred in Johannesburg where LV busbar fault currents - referred to the HV side - were insufficient to blow HV fuses and resulted in minisubs being completely gutted.

It should be noted that minisubs equipped with low voltage MCB's for outgoing circuits can have as little as 15mm between bare phase terminal posts. Consequently the chances of a flashover between phases caused by dust, moisture or vermin are considerable.

In that event one can expect little or no protection from the associated transformer's HV fuses.

Information obtained from minisub manufacturers indicated that only about 15% AMEU customers omit HV fuse protection of transformers.

Some considerable re-thinking of this aspect therefore appears to be necessary, particularly as a saving of approximately R1 000.00 per minisub is possible where an HV isolator is used instead of a fuse-switch.

As far as transformer HV faults are concerned, the installation of earth fault indicators (automatic reset type preferred) would localise HV faults in minisubs and associated HV cables.

### Item 4.5: Provision of Main LV Switches

There are very good reasons why a main LV circuit breaker should be included in a minisub. These are:

#### 1. Statutory Requirements

It is a statutory requirement that main switch disconnects be provided for busbars.

In terms of MOSA, Code of Practice SABS 0142, Section 4.4.4 Sub-Section (a), this reads "Each distribution board shall be controlled by a switch disconnecter that is mounted on, or adjacent to, the distribution board."

#### 2. Overload and LV Fault Protection

Proper protection can be provided by a main LV circuit breaker. This matter is covered under Item 4.4.(c) above.

## CONCLUSION

In view of the foregoing, it appears that there are technical advantages in omitting HV fuse protection from minisubs, and, instead, providing a main LV circuit breaker and earth-fault indicator. The resulting increased cost would be of the order of 2%, but this would be compensated by compliance with MOSA, efficient overload and LV fault protection and enhanced fault locating facilities.

The above proposal, as set out below in FIG 1: Schematic of Minisub Equipment, may appear to be contrary to the author's theme of "Cost Reduction," but in effect it provides statutory and technical facilities that are absent from the arrangement indicated as "Usual Arrangement" in Fig. 1.

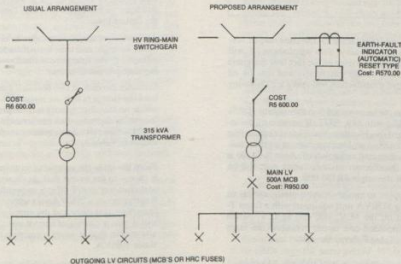


FIG. 1. SCHEMATIC OF MINISUB EQUIPMENT

The authors have presented a paper which is interesting in itself and likely to have far-reaching effects on electricity distribution practices.

In the comments that follow the sub-section numbering in the paper will be used and only those sub-sections on which discussion is desired will be mentioned.

#### 1.1 The transformer market and its place in the distribution industry:

Expressed in percentages of the total transformer market the figures given by the authors are as follows:

TABLE 1

Category 1: Over 40MVA and over 132kV	28,6%
Category 2: Above 3150kVA to 40MVA, 132kV	21,4%
Category 3: Distribution Transformers	28,6%
Category 4: Miniature Substations	21,4%

We feel that, in the context of the present paper it is important to mention that the miniature substation sector appears to be increasing quite rapidly at the expense of distribution transformers.

#### 1.4 The economic effects of standardisation:

While it is not in any way the intention to belittle the benefits that can be derived from Standardisation, it is necessary to keep one's feet on the ground so far as cost savings on such products as power transformers and miniature substations are concerned. Taking, for power transformers, the example of a 10MVA, 66/11kV transformer with on load tap changer gear, Table 1 shows costs of a present-day unit together with an estimate of the costs that would be applicable to a "standardised" unit having the same losses and impedance (changes to these latter quantities as a result of standardisation could affect the costs but not necessarily in the favourable direction).

TABLE 2

	PRESENT-DAY	AFTER STANDARDISATION	
	COST (RAND)	COST (RAND)	% SAVING
Material	90 000	86 000	4,4
All other Costs	40 000	32 000	20,0
Total Cost	130 000	118 000	9,2

In Table 1 it is assumed that, albeit for the same output, losses and impedance as previously, a saving of about 5% will be possible on materials by virtue of the fact that designers can study a repetitive product minutely, and that on all other costs repetitive manufacture will make a 20% saving possible.

The total cost saving to be expected is in the vicinity of 10% when comparing like with like, BUT, if because of the influence of a standard specification, a purchaser decides that he does not really need an on-load tap changer on the transformer, then a further cost reduction of about R40 000 is possible and the transformer manufacturing cost will be only about 60% of the original R130 000.

The same thing applies to miniature substations, and, as an example we take a 315kVA unit equipped with a fused T-off ring main unit on the M.V. side and an L.V. switch panel containing moulded-case circuit breakers (one main and four feeders). Table 3 shows the costs.

Once again a saving in the vicinity of 10% can be expected from standardisation when comparing like with like, but if a standard specification influences the purchaser to decide

TABLE 3

	PRESENT-DAY	AFTER STANDARDISATION	
	COST (RAND)	COST (RAND)	% SAVING
Material	13 500	12 800	5,2
All other Costs	5 000	4 000	20,0
Total Costs	18 500	16 800	9,2

to use links instead of a ring main unit then further cost reductions of about R6 000 would be possible and total cost would now be only about 58% of the original R18 500.

It would seem, therefore, that so far as cost savings are concerned, the main usefulness of the standard specifications, for both power transformers and miniature substations will be as a guide to cheap but acceptable practice.

#### 2.2 Power Transformer ratings and voltages:

We agree that the proposed specification should have a range starting at the upper limit of the SABS 780 range and extending to 40MVA, 132kV.

#### 2.3 Physical dimensions:

It would presumably be beneficial to users if limits were set on overall dimensions, and standardisation could be achieved on plinth dimensions, the positions of main terminals, on-load tap changer operating gear and auxiliary terminal boxes and we would support this suggestion.

#### 2.4 Impedance:

We do not think that the constant ohmic impedance design is justified over the range in question for the reasons given in the paper and for the additional reason that it precludes the use of simpler, very reliable windings that have come into use during the last 25 years, in which the windings are simply placed on the outer layer or layers of the main H.V. Coil.

#### 2.5 Losses and Loss Capitalisation:

With regard to the capitalisation of losses, the paper brings out clearly in the curves of Figure 1 the importance of the interest rate and of the projected working life of the transformer: if, as the authors suggest, an appropriate value for the interest rate in real terms is as low as 3%, then, for a projected life of 30 years, the capitalisation factor is the high figure of 19,7 - i.e. it is worthwhile, at the time of purchase, to pay R19,7 for every rand saved per annum on the cost of losses.

As a consequence, the capitalised values of the transformer losses are high, and tend to overshadow completely the significance of the first price of the transformer, as the following example will illustrate:

Consider the case of two 66/11kV transformers without on load tap changers that are intended to operate in situations where no standby capacity is to be provided, and are therefore to be capitalised on the formula  $V_2 = P + 8000.L_0 + 3600.L_1$ . The relevant quantities would be approximately as shown in Table 4.

From the table the comparative unimportance of the price is clear - to the extent that, as shown in the last column, a manufacturer could offer a conventionally made 20MVA transformer as a 10MVA unit with no alteration at all other than the rating plate and, by virtue of the fact that the load loss is now a quarter of what it was at 20MVA, provide an alternative that is more attractive than a conventionally made 10MVA.

Of course, this is not intended to invalidate the soundness of the capitalisation analysis in the paper, but merely to emphasise the great importance there is in selecting values for

TABLE 4

MVA	20	10	20 MVA sold as a 10MVA
Price	190 000	140 000	190 000
No-Load Loss (Kw)	18.5	10.5	18.5
Load Loss (Kw)	90	59	22.5
Capitalisation:			
First Price (R)	190 000	140 000	190 000
Cap Value of no-load loss (R)	148 000	84 000	148 000
Cap Value of load loss (R)	324 000	212 400	81 000
Total Cap Value	662 000	436 400	419 000

the various factors in the equations, particularly the interest rate.

What it amounts to is that the purchaser is paying *now* for benefits perceived to be coming to him over the next 30 years, and, although the matter is essentially one for the users to sort out, one feels that more research is needed on the question of interest rates in the long term, and on the economic soundness of paying *in full* right at the beginning for savings to come later.

#### 4.2 Ratings, Voltages and Tappings for Miniature Substations:

Although 800 and 1000kVA miniature substations are sometimes used, and are no doubt justified when the arrangement includes expensive components such as Ring Main Units, it is perhaps better to confine a standard specification to ratings up to 630kVA.

We applaud the idea of extending the range to cover 22kV miniature substations, and most manufacturers would be happy about omitting tappings.

#### 4.2 Miniature Substation constructional requirements:

Miniature substations designed as single fabricated units will no doubt bring cost savings but attention must be drawn to the fact that such a construction precludes the possibility of galvanising the underbases and (as favoured by coastal users) the switchgear compartment housings. The use of 3CR12 could, however, still be resorted to for those users who fear corrosion.

#### 4.4 Requirements for the M.V. Compartment:

Two cable terminations and two sets of links: Miniature substations of this type have for many years been supplied to no less a supply authority than Escom (Cape Western) who appear to be perfectly happy with the arrangement. We feel, therefore, that for the abundant low cost electricity distribution needed in South Africa this must be supported as one of the options. From the safety viewpoint, however, it might be necessary to ensure, by way of pilot cables, that an entire ring is cut off from supply when a medium voltage compartment door is opened, and the cost of this could well negate the saving on the miniature substation itself.

Two load-break, fault-make switches:

This arrangement provides a faster way of cutting a faulty section out of a system and provides a safe and reasonably convenient method of operation that should be encouraged and could well become the commonly accepted method.

The ring main unit with or without fuses on the T-off:

There will always be cases where switching on the transformer T-off is genuinely desirable, and a standard specification could well allow for this option *provided* the provision does not make the cheaper options more expensive – in other words the construction used for miniature substations equipped with Ring Main Units might have to be *only* for that type.

Ring Main Units utilising SF6 and thus free of the presence of oil have been used, when required, in miniature substations for several years, while new designs, also using SF6,

are at present being developed especially for the miniature substation market.

#### 4.5 Requirements for the L.V. Compartment:

Moulded case circuit breakers:

In spite of the increase in expense, we think that a standard specification should encourage the use of moulded case circuit breakers, and that these should be specified without the alternative of fuse pillars.

We agree that, with MCBs on all feeders, the main MCB could be dispensed with, but only when there is a switch on the transformer T-off on the MV side; when there is a solid transformer T-off then the LV main circuit breaker should be retained.

It is worth mentioning that circuit breakers are available which operate in the oil of the transformer and can give protection which is a function not only of the overload current but also of oil temperature; thus when the oil is cold substantially more overload would be permitted than when the transformer is hot.

Provision of additional circuitry:

It will not be practicable to allow the indefinite proliferation of equipment in the L.V. Compartment in a standard specification, but it might be reasonable to include a street lighting panel for those users who find this the most cost-effective place for housing such equipment.

While the idea of a standard frame for the L.V. Compartment is attractive from the standardisation viewpoint, our most recent thinking is that greater economy is attainable if the equipment is built directly into the L.V. Compartment – i.e. supported from appropriately welded-on plates and brackets rather than from a separate frame. Perhaps a compromise would be possible by calling for the L.V. Compartment to be equipped with the necessary brackets etc in a standard configuration.

### MR AJ NEALE: AFFILIATE

#### 1. INTRODUCTION

Mr. President, Messrs. Van Alphen & Jansen, Ladies and Gentlemen, I will restrict my response to that covering miniature substations only. We as manufacturers of miniature substations (mini-sub) fully understand that end-users have many varied and specific applications for their individual mini-subs. We therefore can appreciate that what the end-user requires in his mini-sub will depend on the particular application and individual likes and dislikes of particular equipment and we realise that no one particular arrangement will satisfy all end-users. Our main contribution will thus be to bring to the attention of the end user what the main cost elements are in manufacturing mini-subs.

#### 2. RISING COSTS

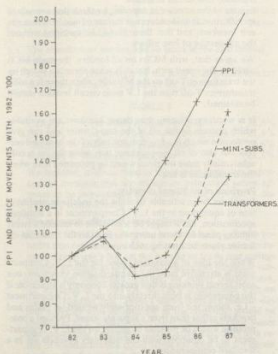
We have noted the increase in the rising cost of mini-subs over the years and whilst the end user is paying more for the mini-sub, the manufacturers are however not necessarily benefitting from these increased costs. The main interest that we as transformer manufacturers have in the mini-sub, is of course the transformer itself. Certain of the manufacturers are in a position to also supply the high voltage switch, but with at least six alternative switches available in the market, they do not necessarily supply their own switch with every mini-sub sold.

As can be seen from Fig. 1, mini-sub prices have risen by 160% over the past 5 years.

From Fig. 1 you will also notice that distribution transformer prices have risen by 130% over the past 5 years.

In contrast to this, the production price index (PPI) has risen by 190% over the same period. What is important to note is that the slope of the mini-sub curve is becoming much steeper than that of the transformer curve and the rise in price of mini-subs is fast approaching that of the PPI.

FIGURE 1



What then makes up the cost of mini-sub and hence is contributing to these fast rising costs?

### 3. COMPONENTS OF A MINI-SUB

#### 3.1 The Transformer:

For most manufacturers this is highly standardised and variations in colour, voltage ratios and fittings do not significantly affect the price. For a typical 315 kVA mini-sub, the transformer invariably never exceeds 30% of the cost of the mini-sub. See Figure 2 for the typical cost variations of the transformer.

#### 3.2 The Base and Cubicle:

The base is also highly standardised with little variations occurring. The cubicle can be either type A (in line) or type B and to a large degree also highly standardised for each manufacturer. The main variations are in the material used for the mini-sub (mild steel, 3Cr12 or fibreglass) and in the type of locking required on the doors. Colour variations do not affect the costs however the level of finish required by some users does have an effect on the cost especially when they require a finish in line with that of a domestic appliance. The cost of the base and cubicle (of mild steel) typically never exceeds 15% of the total mini-sub cost. Figure 2 shows that this cost can almost double depending on the choice of material and special fittings.

#### 3.3 The High Voltage Compartment

There are various options that can be fitted in the mini-sub and these can vary from HV fuses only, ring main switches with or without fused T-offs, to the addition of a HV metering compartment.

The choice of option can add considerably to the cost of the mini-sub, however, from the manufacturers point of view, the cost of fitting either arrangement is "a much of a muchness". Cubicle designs are reasonably standardised to accommodate the various options with little extra costs. A typical ring main switch with fused T-offs can nonetheless add as much as 30% to the cost of the mini-sub. From Fi-

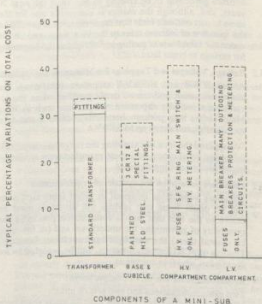
gure 2 it can however be seen that other choices of ring main switch can increase the cost component of the high voltage compartment.

#### 3.4 The Low Voltage Compartment

The options available here are endless and this is the prime area for standardisation to reduce costs. The options used here in practice vary from LV fuse pillars to mini-sub with main breakers, as much as 12 breakers for outgoing circuits, kWh meters, ammeters, voltmeters and numerous types of control circuits - in fact the options are endless! Without exception no two users have the same requirements and some users even have requirements where no two of their mini-sub are the same.

TYPICAL PERCENTAGE VARIATIONS ON TOTAL COST FOR VARIOUS COMPONENTS OF A MINI-SUB.

FIGURE 2



The typical LV equipment costs are in the order of 25% of the total mini-sub costs.

If we however, consider the added value in terms of time and overheads that a manufacturer puts into a mini-sub, and also treating the transformer, HV switch, breakers and all other components are bought out material, then the cost of engineering, manufacturing the support frame and fitting the LV equipment is typically 40 - 45% of the added value! Figure 2 indicates typical cost variations of the low voltage compartment depending on the options chosen.

### 4. CONCLUSION

There are many opportunities for cost savings, particularly in the choice of equipment for the HV compartment, the material type for the cubicle and the requirements of the LV compartment.

It is chiefly the variety of components and the increases in the cost of components that have added to the rising cost of mini-sub. Material and component savings can thus considerably reduce the cost of the mini-sub. From the manufacturers point of view, and when one particularly considers added value, the greatest opportunities for cost savings lie in the standardisation of options for the LV compartment.

Whilst mini-sub prices have been rising rapidly, the end user has been in the fortunate position to purchase sophisticated

mini-sub rather cheaply. This scenario cannot continue and unless some degree of standardisation takes place, manufacturers will soon be demanding a fair and equitable return for running "jobbing - shops" to cater for the many variations in the manufacture of mini-sub and, hence, adding to the cost spiral.

#### MR FLU DANIEL: CAPE TOWN

I would like to congratulate the authors on this new approach to the formulation of standards. Technology is advancing at such a pace these days and it is more than a challenge to those charged with the task of issuing National Standards keeping abreast of the developments, let alone incorporating these in their specifications. The ideas that have been presented to us by the authors do a great deal to assist industry in its challenge to keep prices competitive in the very inflationary markets of today. If the new standards are going to bring about material cost savings I have no doubt they will receive all the necessary support from manufacturer and user alike.

#### Transformer Market Statistics

Mr Jansen has quoted figures for the various categories of the transformer market and I would enquire of Mr Jansen if these are merely estimates or figures abstracted from statistical records as I would have thought that the figures given for categories 3 & 4 should have been slightly higher, particularly category 4 which is gaining in popularity for urban distribution.

#### Transformer specification

The extension of the transformer range from that presently covered by SABS 780 for ratings from 5 to 40 MVA with a voltage ratings up to 132 kV is more than overdue. The idea of developing a specification using the IEC and ESKOM specification as a basic guide will be the right catalyst to having the specification completed in a short time. I agree with the author that by standardising on ratings, voltage, impedance voltage, tapping range and to some extent physical dimensions much can be done to reduce transformer costs.

It is most pleasing to note that the concept of constant ohmic impedance is not favoured because of the overall approximate 10% increase in cost with little technical advantage in the 5-40 MVA class range. The setting of some standards for the physical dimensions of the transformers, if at all practical, would allow designers to pre-plan substation layouts well in advance of calling for tenders, for transformers. The construction of the substations could be phased to suit the delivery of the transformers thereby effecting overall cost savings.

Mr Jansen has shown that the capitalisation of losses plays a very important role when evaluating tenders for transformers. His idea of using a standard formula would greatly aid the transformer manufacturer in designing economical units provided major users accept this philosophy.

I do however think Mr Jansen should also make allowances for those Authorities who install three similar units, one serving as a spare i.e. the spare unit forming 50% of the firm substation capacity.

#### Mini-substations

I find it quite disconcerting that it has taken so long to realise that the objections raised to the original specifications are only now being actively pursued. The question of interchangeability for field maintenance purposes was a philosophy which had little practical application and the new concept of individually rated units goes a long way towards the manufacturing and marketing of cost-effective mini-sub.

Of the three basic designs suggested the unit with link in the MV compartment will naturally be the most cost-effective. Offset against this saving cognisance has to be taken of operating procedures which will allow and ensure safe operating conditions on site at all times. It would appear that operating can only be done when the circuits are de-energised if safe operating procedures are to be achieved. Mini-sub find their main application in urban housing schemes where the continuity of electricity

supply is of vital importance. Supply outages cause great concern especially if they occur at peak periods and operating staff have to restore supply quickly if consumer hostility is to be avoided. A system planner should therefore cater for the easy identification and isolation of fault equipment and the easy re-configuration of the network to restore supplies.

The units using ring main units or load break isolators when equipped with some form of earth fault indication give that additional protection to enable quick and safe supply restoration.

Designers should not always consider first costs when recommending schemes for those first cost savings can be more than eroded if special operator protection has to be employed especially during times of unrest in the townships. Operator security is a factor often overlooked by those not closely associated with the day to day realities of urban conditions.

I note that provision is being made for units of rating from as low as 100 kVA and I would question the advisability of using such a rating. It would be interesting to hear from transformer manufacturers if it is not more economic to limit ratings to say 200 kVA.

The modifications to the mini-sub design proposed appear to be both cost effective and practical. The tapping switch, however, should be retained as an optional extra especially for those authorities with poor voltage regulation. Mini-sub prices have decided impact on the cost of urban reticulation schemes and the smaller the unit standardised upon the greater this impact will be.

Recent mini-sub purchases suitably illustrate this effect.

(Load of 2.5 kVA per unit)

Transformer Rating kVA	No. of Consumers supplied	Unit Cost R	Cost per erf R
100	40	19 000	475
200	80	20 000	250
315	126	25 500	202.38
500	200	28 700	143.50

It will thus be seen it is more economical using longer rating transformers than many smaller rated units.

The proposed maximum rating of mini-sub is 630 kVA and I would question if it is not at all possible to incorporate 800 kVA units as a standard as this rating finds ready application in high density urban development.

I am of the opinion that the mini-sub has established itself as a primary element in distribution schemes in South Africa and therefore the time has come when greater liaison is necessary between MV switchgear and transformer manufacturers with a view of designing custom built MV switchgear solely for adaptation to mini-sub.

It would be advantageous if new generation ring main unit/load break isolator is designed to form an integral part of the mini-sub and not an add on unit as at present. I am sure this would lead to ultimate cost reductions in mini-sub.

The author has mentioned that transformer manufacturers are not normally manufacturers of LV switchboards for the low voltage compartments but I am sure with the increase in the mini-sub market this situation might well change if the manufacturer is to remain competitive in this specialised field. This would also enable the manufacturer to do comprehensive overall testing of the units up to the outgoing terminals of the LV switchgear.

In conclusion I should once again express my appreciation of the discussions and Workshops arranged by the authors. These have gone a long way to create a better understanding of the Standards Bureau, the requirements of Industry and the purchaser's needs. It is with this type of co-operation that workable and cost effective standards can be implemented.



## MR LE HUNT: WHITE RIVER

In September 1973 White River was a small country town with a maximum demand of 1650 K.V.A.

Consumers in the Urban area were supplied from 8 indoor substations and 4 of the old slender type Mini-substations a ratio of 2 to 1.

By June 1987 the demand had grown to 8800 K.V.A. A growth rate of some 13% almost twice the national average.

By the winter of 1988 demands is expected to reach 1500 K.V.A.

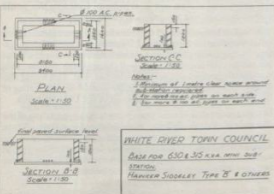
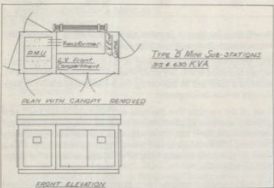
Of the original indoor substations 4 have had to have their transformers replaced by larger units. (50%).

Of the original slender type Mini-substations two have been replaced by more modern units with Ring Main Units, one because it was simply too small and one because the transformer broke down.

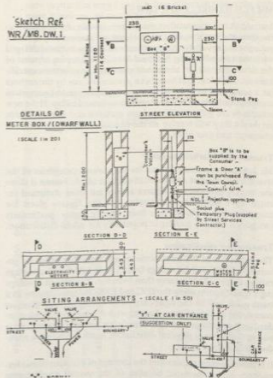
Today there are 11 indoor substations and 46 Mini-substations a ratio of 1 to 4. This change of preference only became possible once the reliability and load handling capacity of the modern Ring Main Units became appreciated and that these units could be installed in more important rings.

Of the Mini-substations installed in the last 10 years one had to have its transformer replaced and one is currently being uprated from 315 to 400 K.V.A. With regard to the latter, it was arranged with the original manufacturer, to supply a complete Mini-substation with a frame size such that the old substation could be lifted off the ring main unit while it remains compounded to its H.V. cables and lower the new unit over the Ring Main Unit. This feature will now become an essential requirement of our future specifications.

Many years ago at a Work Study meeting it was stressed that: "The most important part of maintenance is Design" 14 years of experience at White River has reinforced the value of this concept. I would therefore make a special plea to abandon the concept of welding the housing integral with the transformer.



At White River the local ring around the C.B.D. has 14 Mini-substations in a route length of 2100m. There are 3 Banks, 3 Building Societies, 4 garages and various supermarkets served from this ring. Most have computers. There is no point in elaborating further.



## MNR R FULS: GEAFILIEERDE

Ek kry die indruk dat die meeste gebruikers van medium spanning verspreidingstransformators en miniatuur substasies tot 630 kVA en selfs hoër, beskerm die transformators teen oorvraging of stroom, terwyl daar algemeen gebruik gemaak word van die temperatuur en wikklingtemperatuur beskerming op hoogspanning en ekstra hoogspanning transformators.

Aangesien temperatuur die beperkende faktor op enige elektresiese masjien is, is ek van mening dat die meerderheid van die medium spanning verspreidingstransformators en miniatuur-substasies onderbenut word, wat op sigself 'n oorkapitalisering tot gevolg het.

Daar moet meer gebruik gemaak word van olietemperatuur en kopertemperatuur beskerming van verspreidingstransformators om daardeur, bykomend tot die SABS voorstelle 'n nog groter bydrae te lewer tot kostebesparing en korter effektiewer verspreidingsnetwerke deurdat veel kleiner transformators vir dieselfde vraag gebruik sal word. Daar bestaan reeds bewese betroubare kort-effektiewe beskermingstelsels om hierdie daad te bereik.

## MR W BARNARD: ELECTRICITY CONTROL BOARD

I would like to congratulate the authors on the initiative they have taken in proposing a reduction in the variety of transformers being manufactured in South Africa.

In die verlede, toe ons as verbruikers al ons transformators ingevoer het, was die beperk tot 'n paar oorsese vervaardigers, mainly imported from the U.K.

Today with local manufacture every distribution engineer has

his own idea of the best solution for any particular installation, which results in a large variety deviating from each other to a greater or lesser degree. It might be of interest that the rationalisation proposed by the Author has been very successfully applied to both switchgear and cable by Electricité de France.

The rationalisation of the plant and equipment used in the supply and generation of electricity in South Africa has been under consideration by the Electricity Control Board for sometime now and on instructions from Minister Danie Steyn a Co-ordinating or Steering Committee is to be established in the near future for this purpose.

The paper presented by Mr Alphen and Mr Jansen hopefully, their and further participation will be a valuable contribution to repairing the substantial economic advantages which, I believe, will result from such rationalisation.

#### MR MAX CLARKE: RANDBURG

Mr. President, as a firm supporter of standardization I subscribe to many - perhaps most - of the thoughts and ideas which form the basis of this very useful and interesting paper. Standardize, simplify, reduce costs, increase productivity . . . hackneyed expressions in some respects . . . buzz words . . . Perhaps! Sometimes even infuriating when they keep coming back at you, but generally I think most of us can live with them.

But I cannot go along with some of the thinking which I sense lies "Behind the Lines" so to speak, of this paper. Let me explain;

Item 4.4 "Requirements for the M.V. Compartment", 4th paragraph says - ". . . Some miniature substations are required for commercial projects where the price of the floor space is so high that it becomes an important factor in the consideration of miniature substations."

Mr President why is the price of floor space so high? I'll tell you; it is because *Electricity*, I repeat *Electricity*, makes it possible to use buildings to maximum effect - think about it; lighting, ventilation, the whole environment without even touching on the machines, equipment and other items that are used in the activities within that building. People are prepared to pay for these facilities.

We spend to much time trying to make the transformer/mini-sub/substation equipment inexpensive and inconspicuous instead of bringing it out of the basement into the main foyer; maybe it should be mounted right there on a pedestal, placed in a heartshaped enclosure, painted pink or green or clad in glorious blue mirrored glass to match the outside of each Architect's monument.

Let us stop walking around with hang-dog expressions and feelings of guilt because the *most important equipment* happens to take up a few square metres of floor space and cost a few Rands. Let's face it, without the electricity there would be no tenants and therefore no "Price Tag" and . . . no building!

And that's not all Mr. President: Item 4.5 on "Requirements for the L.V. compartment", 7th paragraph reads "The provision of M.V. or elaborate L.V. protection equipment would probably not be justified for the normal residential supply mini-sub. The incidence of faults in cable connected networks is so low that one cannot commit money to systems to deal with those few faults."; for a start I must remember to show that to my colleagues in the water, sewerage, Roads and Parks Departments . . .! Incidents of faults being so low that is!

Maybe within the context of the paper itself that statement is reasonable . . . maybe . . . but I want to warn you all again, as I have done on other occasions, that we must not lose sight of that vital feature of 20th Century Living, *reliability* of the electricity supply.

Never let us forget that we are living in the 20th Century; electricity makes it what it is! This paper gives us ideas of how we can do things to make transformers and mini-sub and protection more cost effective. But remember that the standards we evolve today are the foundations which will have to carry the

21st Century . . . Yes Mr. President . . . It's just around the corner . . . I make bold to suggest we ask ourselves "can we afford *NOT* to have elaborate protective equipment as standard in our future mini-sub?" Residential loading or any other for that matter, it all needs reliable power and the demands for reliability are rising not falling!

Go back to the report by Mr Wessel Barnard tabled at this very Convention, following his visit to the International Symposium on the Distribution of Electrical Energy (Report 21), and you will see that a not insignificant part of the proceedings was devoted to (quote) "Means of Improving Quality of Service of Electricity Networks". Take note of that word "Quality".

And I am not the only one who thinks Electrical Engineers are very important people. When the Mayor of Stutterheim, C1. Trevor Collett welcomed our East Cape members to their recent meeting he said . . .

"You people assembled here today are involved in possibly the most important industry in South Africa today and you certainly are charged with a vital role in changing the fact of our Country . . ."

He went further and said . . .

"It is an opportune time to thank the members of the Electrical Departments in the Municipalities in our area for helping us Councillors to balance our budgets . . . what would we do without electricity accounts I really cannot imagine." What about Minister du Plessis' opening remarks and C1. Buckle, Mayor of Boksburg in welcoming us to this very Convention also emphasised this fact of 20th Century life.

Mr President we must not underestimate the importance of the service we provide; we must stop selling ourselves short; we must stop hiding our "light" under the proverbial bushel.

I am all for standardization to achieve cost effectiveness, *providing it improves the reliability of the supply*. Our consumers complain when the tariffs go up a few %, but that's small fry compared to their reaction when the *lights go out!*

#### MR DC PALSER: HONORARY MEMBER

Mr President, in view of the fact that the authors have referred to my paper on Engineering Economics I feel that I should at least comment on one or two economic aspects, particularly those relating specifically to capitalisation formulae in an inflationary climate with load growth. This was a point I merely touched upon in my paper.

I note that the authors have chosen to use a real interest rate reflecting the difference between the nominal money interest rate and the electricity tariff escalation rate. As mentioned in my paper, however, I consider it more realistic and representative of the real world to reflect interest rates and inflation rates separately in the relevant equations. In the inflationary climate postulated, though, either method will give the right answer.

Regarding the choice of 3% as the real discount interest rate in the long term, I have no argument with this figure. It is of the same order of magnitude as the figure mentioned in my paper as being typically representative of real interest rates, namely monetary rates net of inflation.

Where, however, I feel that the authors may have gone wrong is in the calculation of their so-called growth factor, "g". The authors state that this "g" factor is determined by "integrating the area under the load curve". This statement apparently ignores the fact that money has a time value. The correct calculation requires that the cost of the losses in each year, as reflected by both load growth and the tariff escalation rate, be discounted back to the present to obtain the relevant capitalisation factor.

If this is done, and assuming similar figures to those used by the authors, it is possible that the capitalised cost per kW of load losses in their 100% standby case should be increased slightly, possibly from their figure of R900 to around R1 100; admittedly not a very significant change.

But unless it has already been done, I feel that more consideration should be given to analysing typical loading patterns of

power transformers in the different environments, such as municipal, industrial and commercial, to ensure that a reasonable compromise is reached on appropriate figures to be used in the respective capitalisation formulae.

I have studied a number of typical loading patterns and using correct discounting techniques have arrived at effective values for  $k$  ranging from 0.3 up to unity. This effective value of  $k$  is equivalent to the authors ( $g.k$ ) factor. The calculation is therefore sensitive to the correct choice for the "g" factor.

I sincerely trust that before finalisation is reached on appropriate formulae all parties concerned, including the AMEU, will be given ample opportunity to comment further. Regrettably there is insufficient data in the written paper to enable this matter to be taken any further at this stage.

## TOWARDS ELECTRIC TRANSPORTATION FOR METROPOLITAN AREAS

R B Anderson and J D N van Wyk

### 1. INTRODUCTION

The subject of the various means of mass transportation of people from the peri-urban areas to that of the central business district, the CBD of a city, has always been a reason for continuous and intense study, often leading however to controversial view points as to the solution. The population of the metropolitan area continues to increase and whilst the numbers wishing to work in the CBD also increases, there is a steady decentralisation of business to suburban or peri-urban areas which mercifully perhaps, eases the problem of mass transit to the city centre, but it complicates the issues considerably.

City transport departments each have their own well established public transport systems and each carries out studies from time to time to improve the situation or to try to meet the problems created by an ever increasing population. Not the least are those engendered by the increasing number of people preferring to use private vehicles, and by the proliferation of smaller vehicles which are tending to replace the heavier city buses. Added to this, the danger of pollution from the fuels that they use has in some cities become paramount, leading to drastic regulations to redress the situation.

One of the city's major transport worries is the question of the need for subsidising public transport in which South African cities are by no means alone in this world. The case for assistance by the State is even stronger in South Africa in view of the political issues facing the city as a result of regulated places of living for the various population groups. It is clear that because there are so many special considerations which differ as between one city and another, all at different stages of development, that no single panacea can be prescribed to solve the problems for all cities, and indeed this paper does not attempt to do so. Rather the authors, being electrical engineers, and addressing their fellow engineers and associated councillors, would prefer to take another direction which could perhaps serve at least as a guide for the future.

This direction is to consider whether a move towards electric transportation for cities does provide some advantages both socially and economically which might result in a happier solution given the further pressures due to dwindling energy resources of the world in general, and South Africa in particular. The growth rate of the transport and population of a few selected cities is to be portrayed based upon their performance during the last 20 years, and will be projected forward to the next twenty years. However the condi-

It is also not clear from the paper what values have been used in the quoted capitalisation formulae for the demand and unit costs of electricity. As we all know only too well municipal tariff rates vary widely across the country, although it is hoped that in time some degree of standardisation and uniformity will eventually be reached along the lines now adopted by Escom. Even with the standard Escom national tariffs there is still the 3% transmission differential across the country.

Finally, two relatively minor points. Firstly, the loss load factor in the paper is quoted as  $kL + (1-k)^2 L^2$ . This is evidently a misprint and should read  $kL + (1-k)L^2$ . And, lastly, it would be better to define  $E$  in the paper as the unit or energy charge rather than the "electricity" charge, as stated.

tions of viability of various electric transport systems can be set against this to indicate at what stage such systems could be seriously contemplated. Finally a look at the possible effects of advanced technology of electric storage systems will also be considered which may have a profound effect upon the transport vehicles of the future.

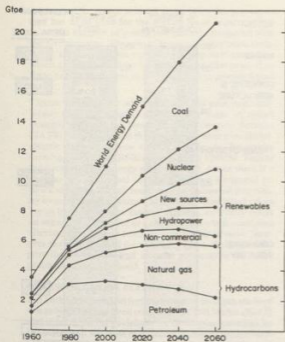
### 2. THE WORLD ENERGY SCENE

Ever since the oil crises of the 1970's the world has taken a serious look at its energy resources and their availability to meet future demands. So far this has indicated that given continued exploitation of alternative energy sources such as nuclear fuel and renewable sources, the world will not be short of energy, at least for the foreseeable future, but it may run out of crude oil for example, and it may have to resort to the use of its coal resources to meet this deficit - especially if nuclear resources cannot be used in view of public resistance to it on the grounds either because of its unjustified image of potential danger, or due to the difficulty of the disposal of its pollutant wastes. That crude oil will most likely continue to decline in its availability to meet world demand has again been re-affirmed in a recent W E C report (Ref 1) as indicated in Fig 1. From supplying about 40% of the world demand in 1980 crude oil will only supply about 20% by the year 2020 as indicated in Fig 2. The demand for crude oil by the transportation system world wide will on the other hand, continue to increase, thus leading to a corresponding real price increase and this will bolster the economic viability of alternative fuels which will have to be produced to meet the deficit.

### 3. THE SOUTH AFRICAN FUEL OIL SCENE

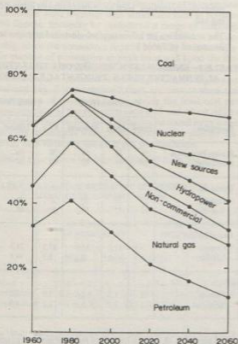
In the South African context, imported oil is thus likely to become both scarce and expensive and it will be necessary to substitute for it by increasing local synthetic fuel production, in this case mostly from coal, as at SASOL. This may even be more expedient from the point of view that the Middle East countries presently hold nearly 60% of the world's reserves of crude oil, and will be in a strong market leader position compared with other suppliers willing to meet South African demands against the Arab embargo.

Whilst South Africa has large coal resources, namely a reserve of 88 Gtce, (1 tce = 29.3GJ) they are not inexhaustible as illustrated by Fig 3 (Ref 2) so there is a case for conserving it already. In addition the cost of new SASOL plants is now of the order of R15 000 million for a size that would double the present output and whilst the cost of production could be competitive with the rising costs of imported fuel, this



World energy supplies

FIG. 1



Structure of world supplies

FIG. 2

capital expenditure is hardly practical today owing to the stringency of its availability.

In view of the above severe limitations on the South African

synfuel scene, an obvious palliative would be that of fostering fuel conservation measures to enable only the most necessary fuel requirements to be met. This could only really be effective by imposing an increase in the price of fuel together with other regulatory measures such as reduced speed limits etc. and by providing increased subsidies to encourage greater use of public transportation.

#### 4. THE SOUTH AFRICAN ENERGY SCENE

As illustrated in Fig. 4 about 25% of the total available energy from coal and oil is input into the transport sector compared with 38% into the electrical sector, and the balance being for direct coal users, mainly industry. However, due to production losses, at refineries and power stations, and the consequent loss when using less efficient devices, the amounts of energy actually applied to work done by the end user is considerably reduced. Only about 10% of the original input into the transport sector is applied compared with more than 20% for electricity usage, and 30% for direct coal users.

As far as the costs to the user is concerned Fig 5 (Ref 3) illustrates that whilst the transportation sector consumes 28% of the total energy, it absorbs nearly 50% of the total cost of energy to the country. The corresponding cost to the consumer at 1984 prices was 1,57 cents/megajoule, or nearly 75% more than the mean cost of energy. These figures highlight the fact that not only is energy, mainly in the form of liquid fuels, utilised most inefficiently in the transportation sector, but it is also by far the most expensive form of energy to use and herein lies the first major advantage of using electricity as a transport fuel.

The following Table 1 illustrates the comparative cost of driving a motor vehicle and a double deck bus for example using liquid fuel versus electricity under city stop/start driving conditions:-

TABLE 1 COMPARATIVE COST OF LIQUID FUELED AND ELECTRICAL VEHICLES

	Motor Vehicles	Double Deck Buses
Liquid Fuel Consumption per 100km	13,0l	50,0l
Cost per Litre	85,0 c	69,3 c
Cost per km	11,1 c	34,7 c
Electricity Consumption per km	0,5 kWh	1,9 kWh
Cost per kWh	5,0 c	5,0 c
Cost per km	2,5 c	9,5 c
% of Liquid Fuel Cost	22,6%	27,4%
Normal Annual Distance	11,000 km	40,000 km
Annual Fuel Savings	R946	R10 080
Capitalised Value (10 years 10% pa)	R5 813	R61 935

The above comparison illustrates that given a reasonable usage of the vehicles concerned - i.e. distance travelled, the saving in cost when using an electric vehicle could justify paying substantially more capital cost.

In addition electric drives for vehicles have longer life spans and require less maintenance than the liquid fueled engines and this will give rise to further savings. For example an electric trolley bus has a proven life of at least 20 years compared with say 10 years for a diesel bus and thus could justify paying almost one and a half times as much for them. According to an authoritative report (Ref. 4), their capital cost should not exceed 50% more, whilst the maintenance cost will be only 60% of that of diesel buses. On the other hand when the cost of maintenance of the overhead electric distribution system is taken into account, the overall maintenance cost per vehicle is about the same.



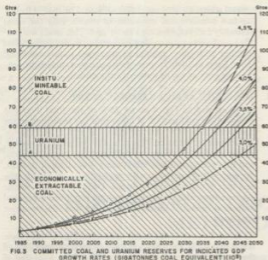


FIG. 3 COMMITTED COAL AND URANIUM RESERVES FOR INDICATED GDP GROWTH RATES (GIGATONNES COAL EQUIVALENT)(10%)

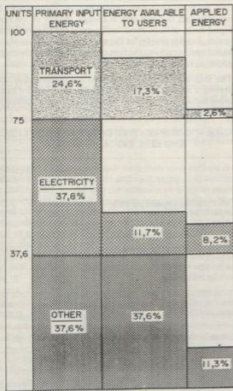
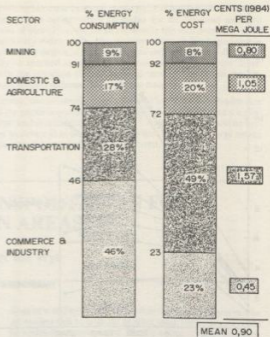


FIG. 4 ENERGY UTILIZATION

In the case of motor vehicles the savings would be applied to the purchase of batteries, and for trolleybuses the cost of the overhead electricity supply system, and depending upon the expected future price of liquid fuel, compared with electricity an electric transportation system could be justified. Each case would have to be considered on its merits and at least one such study (Ref.5) could justify a trolleybus system in the longer term.

However a market movement towards such systems would not take place unless the economic gain was significant enough to attract customers, especially in view of possible



ENERGY CONSUMPTION AND COST (1984)

FIG. 5

other disadvantages, such as limited range of inflexible routing etc.

The second major advantage of electrical transportation is illustrated in Table 2.

TABLE 2: ENERGY EFFICIENCIES OF UTILIZATION OF ALTERNATIVE FUELS (PERCENTAGE VALUES)

Description	Coal-Derived Fuels			Electric Power		
	Petrol	Diesel	Methanol	EV's	T/Buses	Trains
Primary Production	38	38	45	36	36	36
Distribution	98	98	95	90	90	95
Utilization						
- Cruising	25	30	35	55	75	80
- Stop/Start	12	15	17	30	60	70
Overall Efficiency						
- Cruising	9,3	11,2	15,0	17,8	24,3	27,4
- Stop/Start	4,5	5,6	7,3	9,7	19,4	23,9
Ratios						
- Cruising	1	1,2	1,6	1,9	2,6	3,0
- Stop/Start	1	1,2	1,6	2,2	4,3	5,3

This Table shows the effects of the efficiency of production and use of the fuels for transportation via the synfuel route compared with that of the electric power route.

In broad terms the efficiency of utilizing the original coal energy source improves when cruising to between 20 and 30% for electricity compared with between 10 and 15% for synfuels as a source fuel. On the other hand in city driving the improvement is from 10 to 20% for electrical output compared to between 5 and 7% for synfuels. Basically this



means that for motor vehicles about twice the amount of coal has to be used for the synfuel route (equivalent of twice the number of production plants), compared with the electric route. The case of buses is similar when cruising i.e. for long distance runs, but for stop-start conditions which are more usual for this type of transport more than three times the amount of coal is needed to provide liquid fuel

Electric trains on the other hand use coal even more efficiently still than diesel driven trains or buses. A recent example given by the South African Transport Services (SATS) Ref 6) indicated that the change-over from diesel-electric traction to pure electric traction on the system saved in the order of R600 million during 1985/86. Thus in the context of the energy scene in South Africa there is a need to encourage fuel conservation from a national interest view point which could only be translated into reality by regulatory measures. On the other hand if fuel prices are to be controlled to achieve this end, electricity offers an attractive alternative as a cheaper fuel which could also alleviate the situation from the user's point of view. However the economics of the various systems of public transport should be reviewed in order to consider the most practical mode to be used.

### 5. TRANSPORT MODE ECONOMICS

It is both fortuitous and fortunate that an in-depth study of this subject has just been completed by Del Mistro (Ref 7) and in his quest for guidelines for developing countries he has calculated the costs of different transport modes varying from minibuses through standard buses to light rapid rail or light rail transit (LRT) as it is also called, - ending with both the older 14 coach heavy rail trains to the newer trains consisting of four three coach modules.

Significant different parameters which he assumed were that of the life and capital cost of the different vehicles and permanent ways together with structures such as stations and depots. Secondly he postulated a range of ridership for two basic line-haul distances of 20 and 50 km respectively, since the economics depend basically on the available number of passengers at peak hour and upon the distances travelled. The results of his studies show that such systems require a minimum ridership to realise the lowest cost and Fig. 6 is constructed from his data to show the progression of transport modes giving the least cost per passenger/km as the ridership increases and which differs slightly for the two line-haul distances assumed since more standing passengers were permissible for the shorter distance, thus reducing the costs per passenger/km.

Table 3 then shows the limits extracted from Fig. 6.

TABLE 3: LIMITS OF ECONOMIC RIDERSHIP FOR VARIOUS TRANSPORT MODES

	Cost Range - cents per passenger km		Ridership - passengers per peak hour	
	20 km	50 km	20 km	50 km
Minibuses	7,6 - 6,1	7,6 - 6,1	< 100 - 500	< 100 - 1 000
Standard Buses	6,1 - 4,8	6,1 - 5,9	500 - 7 000	1 000 - 6 000
New Heavy Rail	4,8 < 2,9	5,9 < 3,8	> 7 000	> 6 000

The clear message provided by Table 3 is that electric public transport can be more economic than liquid fuelled vehicle transport if the ridership exceeds about 6 000 passengers per peak hour and direction and if so, the particular mode should be provided since public funding is involved by way of the subsidy which unfortunately perhaps, has to be provided. This subsidy in the case of buses is at present of the order of 40 to 60% of the operational cost. (Ref 8) depending upon the conditions and distances of travel in a particular area.

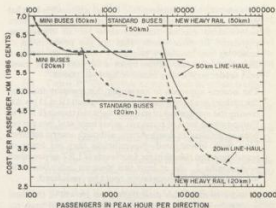


FIG 6

Since light rail transit (LRT) has not yet been used in South Africa, sufficiently detailed information to compare it with existing transport modes in general, is not available, but a recent study (Ref 9) indicated that it is an economic proposition to be seriously considered for Port Elizabeth.

Many European and North American cities have transportation systems which clearly show that their needs are best met by a combination of several modes of transport, each being determined by the maximum level of passenger loading during peak hours - i.e. a combination of either bus, tram or trolley bus, LRT or heavy rail. The usual figures adopted are that buses would be used up to a maximum loading of 10 000 passengers per peak hour and direction and heavy rail in excess of 40 000 - which is a figure regarded by the SATS as the minimum for its passenger services (See Ref 9).

Thus it may be concluded that there is a definite place for electric transport systems which could compete with heavy rail when the ridership lies between 10 000 and 40 000 passenger-kms.

Some further data from Europe (Ref 10) indicates actual relative running costs of diesel and electric transport modes operating over a distance of 15km in West Germany, as illustrated in Table 4.

TABLE 4: RELATIVE RUNNING COSTS OF SOME TRANSPORTATION MODES OPERATING IN WEST GERMANY (15km ROUTE)

Case	Mode of Transport	Places per hour and direction	Relative running cost per 100 places
1	Standard (Diesel) Bus	2 520	1,00
	Articulated Diesel Bus		
	Double Articulated Electric Bus	2 740	0,53
	8 Axle LRT		
2	Standard (Diesel) Bus	5 040	1,00
	Articulated (Diesel) Bus		
	Double Articulated Electric Bus	5 480	0,50
	8 Axle LRT		

From Table 4 and since the ridership is in the range for standard diesel buses, it can be concluded that there are conditions under which both electric trolley buses and LRT could compete with diesel buses and even with the heavier rail transportation of the SATS, depending upon the capital cost of the infra-structure which for these modes increases substantially as the heavy rail system is approached.

sections. Computerised automatic train control is essential as there is a strict demand for availability and close headways.

The heavy traffic density necessitates 2,65m wide vehicles and high platforms throughout the stations. Three-car trains can lift the maximum capacity to 37 000 places/hour/direction.

Level III needs a specific weekday transport performance of at least

14 000 passenger-km per line-km. Compared with Level II it costs more than twice as much to build. It can easily be upgraded to a Level IV system.

LEVEL IV – MAINLY EXCLUSIVE RIGHT-OF-WAY WITH TUNNEL AND ELEVATED SECTIONS, TRAIN PROTECTION AND HIGH PLATFORMS THROUGHOUT

TABLE APP 1 – FIELDS OF APPLICATION AND DESIGN PROFILES OF LRT SYSTEMS

			Principal features			
			LEVEL I	LEVEL II	LEVEL III	LEVEL IV
Fields of application	City and travel demand classification	Size	Small city	Medium city	Large city conurbation	Metropolis conurbation
		Population of service area (x1000)	200-400	400-800	800-1600	above 1600
		Population density in traffic corridor (inhabitants/km <sup>2</sup> )	1900	3800	5400	7700
		Public transport demand of a 16km long corridor (patronage/weekday)	20,000	40,000	80,000	120,000
		Additional demand from feeder traffic (patronage/weekday)	5,000	10,000	20,000	30,000
	Criterion for choice of system level	Minimum specific transport performance per weekday (passenger-km/link-km)	4,000	8,000	14,000	20,000
Design profiles	Guideway	Alignment Right-of-way	At grade 30% shared 70% separate	5% tunnel/aerial 20% shared 80% separate/excl	20% tunnel 100% separate and exclusive	50% tunnel 100% separate and exclusive
	Stations	Average station spacing (m) Platform length (m)	500 40	600 60	750 90	1,000 120
	Vehicles	Vehicle width (m) approx Passenger capacity of 6-axle car (8 standing passengers/m <sup>2</sup> )	2.40 180	2.50 (2.65) 180 (300)	2.65 300	2.65 300
	Operation	Max. cars/train Min. headway (sec) Max. capacity (places/h/direction) Average operating speed (km/h)	2 120 11,000 20	3 (2) 120 16,000 25	3 90 37,000 30	4 90 49,000 40

Densely populated large cities and conurbations with more than one million people and very high traffic volumes need an LRT system which has mostly exclusive rights-of-way and high platforms throughout. A larger proportion of inner-city sections should be in tunnels or elevated. In other areas it is possible to have separate or exclusive rights-of-way with grade crossings or intersections provided the LRVs always have priority.

There is train protection throughout. Fully-automatic operation is possible where vehicles and guideway are suitably equipped. The 2,65m wide vehicles have no steps and can be made up into four-car trains. The maximum capacity of Level IV is 49 000 places/hour/direction, which is sufficient to satisfy a very high demand indeed.

A level IV LRT system has a performance approximating very closely to that of an underground system but at significantly lower capital cost due to the greater versatility of light rail transit in adapting to actual town planning and traffic conditions.

#### FIELDS OF APPLICATION AND DESIGN PROFILES OF LRT SYSTEMS

The attached Table Ap. 1 conveniently lists the main features and design profiles for the above referred to levels of application of LRT systems. They have been modified to South African conditions whereby up to 8 passengers per square meter is permissible for peak hour passenger density.

## APPENDIX 2

### POPULATION GROWTH RATES

Population data were obtained from the Central Statistical Department corresponding to the magisterial districts for which the vehicle population has been ascertained and was included to cover the whole of the metropolitan area of seven major cities and the Pretoria-Witwatersrand-Vereniging (PWV) Area. It is possible therefore that not all areas were included and that the population corresponding to the number of vehicles may be in error. However, a check with the populations quoted in the respective Municipal Year Book showed close agreement and were therefore acceptable for the purpose of the paper. In the event of a more detailed study, the population growth for the whole area served by the city transportation system would have to be ascertained.

Data were obtained back to the 1960 census and were processed to obtain the least squares fit to an exponential growth rate for each of the ethnic groups and with only two exceptions, the correlation was statistically significant.

The total population for each area as determined by the resultant equations as at 1985 is given in Table Ap. 2.1 attached together with the growth rate and corresponding doubling rate. To estimate the population for the year 2005, the growth rates of the individual ethnic groups were used to project the population 20 years hence (from 1985) and

were then added to give the total value. The corresponding mean growth rate to achieve this value was then calculated and is shown in Table Ap. 2.1.

In the case of Durban and East London, adjustments had to be made to the population figures to account for the fact that large portions of the

majority ethnic group were at some stage allocated to the homelands and this had to be estimated in order to correspond to the vehicle population figures. The confidence in this adjustment was not as high as that of the remaining areas because of uncertainties in the methodology used.

TABLE AP 2.1 - TYPICAL POPULATION GROWTH OF CITIES

	1985 Population X 1000	LAST 20 YEARS		NEXT 20 YEARS	
		Growth % pa.	Doubling rate years	Estimated population 2005 X 1000	Mean growth rate % pa.
East London	136	2,17	32	206	2,06
Bloemfontein	273	1,81	39	400	1,91
Port Elizabeth	635	2,90	24	1 147	2,96
Pretoria	818	1,23	57	1 205	1,95
Durban	1 012	2,52	28	1 590	2,26
Cape Town	1 202	2,64	27	2 293	3,23
Johannesburg	1 663	1,41	49	2 263	1,54
P W V	6 109	2,52	28	10 350	2,64

## APPENDIX 3

### GROWTH OF ROAD VEHICLE NUMBERS

The statistical section of the Department of Transport supplied figures of the numbers of passenger cars, minibuses and buses for the magisterial districts covering the metropolitan areas of seven major cities of South Africa and the P W V area, and the best fitting least squares regressions were computed for the period 1965 to 1985 to give the mean growth rate and by extrapolation to provide a rough estimate as to the

growth for the following 20 years. These estimates are shown on Table Ap. 3.1 together with the population data described in Appendix 2 for the equation value for both 1985 and the year 2005.

From this data the number of vehicles per 1 000 of total population could be ascertained but by the year 2005 should be very conservative in view of the fact that the affluence of the major ethnic group over that period will be in excess of that achieved over the last 20 years. This will probably affect the number of passenger cars more than the numbers of public vehicles and possibly could mean a reduction in the numbers of

TABLE AP 3.1 - GROWTH OF NUMBERS OF PASSENGER CARS, MINI BUSES AND BUSES (1985-2005)

Place	1985			Increase rate % p.a.	2005		
	Vehicles	Population	Vehicles per 1 000		Vehicles	Population	Vehicles per 1 000
<b>PASSENGER CARS</b>	X 1 000	X 1 000			X 1 000	X 1 000	
East London	37	136	272	2,64 %	63	206	306
Bloemfontein	51	273	187	2,98 %	92	400	230
Port Elizabeth	83	635	131	3,15 %	154	1 147	134
Pretoria	259	818	317	5,15 %	706	1 205	586
Durban	211	1 012	208	4,78 %	539	1 590	339
Cape Town	233	1 202	194	3,93 %	483	2 293	211
Johannesburg	367	1 663	221	3,36 %	711	2 263	314
P W V Area	1 315	6 109	215	5,05 %	3 524	10 350	340
<b>MINI BUSES</b>	X 1 000	X 1 000			X 1 000	X 1 000	
East London	0,90	136	6,6	8,05 %	4,25	206	20,6
Bloemfontein	1,87	273	6,8	10,13 %	12,87	400	32,3
Port Elizabeth	1,96	635	3,1	9,27 %	11,55	1 147	10,1
Pretoria	11,30	818	13,8	12,49 %	119,03	1 205	98,8
Durban	6,51	1 012	6,4	10,94 %	51,93	1 590	32,7
Cape Town	6,62	1 202	5,5	8,47 %	33,61	2 293	14,7
Johannesburg	17,18	1 663	10,3	12,81 %	191,29	2 263	84,5
P W V Area	53,44	6 109	8,7	12,41 %	554,69	10 350	53,6
<b>BUSES</b>	X 1 000	X 1 000			X 1 000	X 1 000	
East London	0,285	136	2,10	2,09 %	0,432	206	2,10
Bloemfontein	0,448	273	1,64	7,63 %	1,948	400	4,87
Port Elizabeth	0,632	635	1,00	3,11 %	1,165	1 147	1,02
Pretoria	2,388	818	2,92	8,01 %	11,299	1 205	9,38
Durban	1,932	1 012	1,91	3,50 %	3,843	1 590	2,42
Cape Town	1,532	1 202	1,27	3,04 %	2,786	2 293	1,22
Johannesburg	3,112	1 663	1,87	4,02 %	6,849	2 263	3,03
P W V Area	9,921	6 109	1,62	6,22 %	33,201	10 350	3,21

standard buses because fewer people would have to rely on using public transport. The high rates of growth for buses for Pretoria and Bloemfontein do not correspond with the population growth which appears to have been quite normal. The reasons for this have not been investigated.

The statistics for selected cities in South Africa are compared with those of other selected cities in the world in Table Ap. 3.2 from data provided

by a World Bank study in Urban Transport (Ref 1). This indicates a large variation in both growth rates of motor vehicles and of population, and corresponding large variation in the per capita values. The data for South Africa does not therefore appear to be at variance with this.

Ref (1) World Bank Policy Study - Urban Transport Appendix Table A-1 - Washington DC (1984).

TABLE AP 3.2 - URBAN TRANSPORT DATA: SELECTED CITIES

CITY	POPULATION		CARS			BUSES	
	1980 (1 000)	Annual growth rate 1970-80 (percent)	Total number 1980 (1 000)	Per 1 000 pop 1980	Annual growth rate 1970-80 (percent)	Total number 1980	Per 1 000 pop 1980
East London	122	2,2	33	266	2,6	257	2,11
Wellington	135	-0,7	61	452	-	256	1,90
Bloemfontein	250	1,8	44	176	3,0	310	1,24
Port Elizabeth	550	2,9	71	129	3,2	542	0,99
Stuttgart	581	-0,8	199	343	2,5	332	0,57
San Jose C.R.	637	3,5	-	-	-	500	0,78
Harare	670	5,2	107	160	3,0	504	0,75
Pretoria	769	1,2	202	262	5,2	1 624	2,11
Durban	894	2,5	167	187	4,8	1 627	1,82
Kuala Lumpur	977	3,5	37	38	-	1 148	1,18
Cape Town	1 055	2,6	192	182	3,9	1 319	1,25
Amman	1 125	4,1	81	72	-	433	0,38
Tunis	1 230	6,4	38	31	-	642	0,52
Nairobi	1 275	8,8	60	47	-	1 100	0,86
Lagos	1 321	3,1	62	47	-	-	-
Accra	1 447	6,7	27	19	-	709	0,49
Stockholm	1 528	3,0	391	256	3,0	1 850	1,21
Johannesburg	1 551	1,4	311	200	3,4	2 555	1,65
Abidjan	1 715	11,0	85	50	10,0	2 410	1,41
Ankara	1 900	4,4	65	34	14,2	781	0,41
Medellin	2 078	3,2	91	44	-	4 800	2,31
Singapore	2 413	1,5	164	68	6,8	6 512	2,70
Bogota	4 254	7,1	180	42	7,8	9 081	2,13
Lima	4 415	4,2	333	75	7,2	8 853	2,01
Hong Kong	5 067	2,5	200	39	7,4	9 278	1,83
Bangkok	5 154	9,1	367	71	7,9	6 300	1,22
Karachi	5 200	5,2	184	35	8,4	12 064	2,32
P W V Area	5 394	2,5	1 027	191	5,1	7 337	1,36
Manila	5 925	5,1	266	45	8,0	31 403	5,30
Jakarta	6 700	4,0	222	33	9,8	4 798	0,72
London	6 851	-0,9	1 932	282	2,6	11 479	1,68
New York	7 086	-1,0	1 545	218	-	10 481	1,48
Cairo	7 464	3,1	239	32	17,0	8 177	1,10
Tokyo	8 352	-5,6	2 219	266	2,5	6 393	0,77
Seoul	8 366	5,0	127	15	11,7	13 000	1,55
Bombay	8 500	3,7	180	21	6,1	3 066	0,36
Paris	8 800	0,6	3 240	368	12,3	7 100	0,81
Rio De Janeiro	9 200	2,4	957	104	12,1	11 000	1,20
Calcutta	9 500	3,0	95	10	5,6	3 160	0,33
Buenos-Aires	10 100	1,7	537	53	10,0	12 089	1,20
Sao Paulo	12 800	4,5	1 935	151	7,8	16 400	1,28
Mexico City	15 056	5,0	577	105	-	18 500	1,23

## DR RALPH ANDERSON:

Thank you Mr President for those very kind remarks and introduction. I just wondered how many people were in Lourenco Marques in 1967 where Naude and I gave our first paper to the Convention and it just occurred to me, on that occasion he did all the talking and I sat in the background. On this occasion we have reversed our rolls. I shall, I hope, do all the talking, but forgive me if halfway through I lose my voice entirely in which case Naude will have to do the best with what is left.

First of all I would like to thank Siemens for some slides that we are going to use and I think we will have to talk to them seriously about using our commercial time in this Association, but they very kindly lent us some slides which we will show later.

Mr President without much more ado, a few introductory remarks about this paper. First of all as far as public transportation is concerned, worldwide it has had to be subsidised. I am not quite sure of the reason why, but I imagine its always the question of the people who use public transportation are not able to pay for it. In our country most of the public transportation is carried out and used by the black population, whilst the rest of us prefer to use private motor cars. Whether it is a good thing or a bad thing, I don't know, but you will see as we proceed through the paper.

As a consequence of this question of subsidies on transport, the State supports the public transport system of this Country and for example bus subsidies vary between 40 and 60% of the operating cost. Emphasis therefore is on operating public transport at the lowest cost possible and this is usually measured in terms of the cost per passenger kilometre.

In South Africa, diesel busses and diesel electric trains in the past, were used and have been used almost exclusively for public transportation, but since the oil crises at least the South African Transport Services have moved as far as possible to electric traction, certainly on dc and ac well and the savings which have been accrued to them have been of the order of R600 million per annum as a consequence of this saving in fuel cost.

The authors, that is Naude and I, have tried to bring to your attention reasons why we should move towards electric transportation. May I have the slide projector on please?

On this first slide you see a World Energy Conference Scenario, most probable scenario of the way in which energy will be used. If you look at the bottom one, Petroleum, you will see that the total output of petroleum is expected to reduce as the years go by. We know that transportation which uses fuels almost exclusively will need more and more fuel as the economy of the world advances and therefore fuel in the future is bound to become scarce and more expensive.

In the next slide, again it emphasises that where as in 1980, oil absorbed 40% of the total energy of the world, in 2020 this percentage has dropped to 20%, so that it is quite clear that the world does expect that ultimately, although it doesn't appear so at the moment, that oil supplies will run out. This has a special reference for South Africa because of our peculiar position in that, we do rely on imported oil to a large extent today and it will be more and more difficult, especially in view of the Arab embargo, for us to get it and we will be paying a high premium for it as it gets scarcer.

Therefore we will think of using more and producing more of our own oil from SASOL and I would like to show you that there are disadvantages to that, as far as the Country is concerned. This shows that if one followed the oil fuel route, looking at the bottom line which is ratios, one will use about twice as much coal. Organic fuels compared with electricity, insofar as motor cars and busses is concerned when cruising shows in town driving one can use nearly four times as much coal for producing fuels for diesel bus transport as using electric transport such as trolley busses and trains.

Electric trains themselves are even more conservative in the use of our natural resources such as coal. And our coal is not entirely inexhaustible. By the middle of the next century very likely we will have some problems if we continue to use it at the rate we are using it now.

We will now look at some of the costs of these fuels. On the lefthand side is the input. First of all the amount of the consumption of the fuel to each of those sectors. The input energy into each of those sectors and one can see from the transport side that one will use approximately 10% of the input of energy in terms of energy. When it comes to SASOL fuels, however, this figure will reduce to 5% because of the less efficient production of fuel compared with the present refineries.

Electricity on the other hand, we use 10% of the input energy and direct coal units, 20% of the input energy. So using energy for transport is very inefficient, there is no doubt about that.

As far as costs are concerned, whereas for transportation we assumed 30% of our total input is for transport. As far as cost is concerned the consumer pays 50% of the total cost of energy, as a consequence of which the energy we use for transportation in the form of liquid fuels is the most expensive energy we could expect to use, being about 75% higher cost than the average, and electricity is very much cheaper than that.

In order to be able to ascertain the costs of running these transport systems, the Witwatersrand University worked out some figures on costs and this is the result of his endeavours which I have portrayed here. It shows that on a cost basis, that is, the cost per passenger kilometre. The passenger peak, the number of passengers carried out in peak hours in one direction. If one moves from fuels that is used by mini busses and busses it becomes cheaper and cheaper as the ridership grows and electricity is obviously the least cost means of transport provided, if you have the ridership.

Just on to one more slide. If you compare for example, the costs of running an electric vehicle on fuel compared with electricity, this shows in any case that the cost of running diesel busses compared with light rail for example, reduces even with the same ridership. Actual figures obtained in a city in Germany over a 15 kilometre route so that one can see that if one moves toward electrical route, one does expect to get savings. It is very difficult to know, whether in any Country or any City, whether one will attain the various riderships. In this case we are indebted to Ryan Consult of Germany for giving us an idea at the population levels, whereby you can expect to get sufficient ridership to run at least four levels of light rail.

The details of these light rails are given in the Paper and I will show some slides very quickly of the various forms and you can see if you look at the population growths of these Cities of ours between now and the end of 2005, we can see that at least Bloemfontein would be able to afford the cheapest light rail. However, in this Country I think, because of the fact that our population who are using this, are not as affluent, we would move those by one level. But let me remind you that in place of the cheapest light rail we could quite easily use trolley busses which are obviously cheaper even to run than light rail.

So if you take the bottom red one as being the area and complement of the order of 200 000 population and above, one can begin to think that some of the groups should be able to support, at least trolley busses. And moving up in population, light rail of various grades to the heaviest light rail 4 which will be very similar to some of the South African Transport Services' systems that are in operation in the bigger Cities.

I am going to go through the next few slides very quickly because our time is obviously running out.

Traffic congestion in Cairo, the thing we want to try to get rid of when we come to big expansion of our Cities. That can be replaced by things like trolley busses in Norway.

Our own Johannesburg trolley bus demonstration project which woefully failed for reasons which are a little bit obscure to me, but nevertheless we did try it out in Johannesburg and I am sure if we had the mind for it, it would have been a success.

A battery bus, this is in Essen, I think in Germany. A mixture of light rail trams and busses in a City.

In Hanover, a park and ride system right up against the railway lines so that people can get out of their cars and take light rail into the City.



A suburban light rail system, I think this one is in Stuttgart, where road and rail are blending in with the environment.

A more sophisticated level 2 light railway. You have to have a platform. This is at Edmonton in Canada.

The light rail 4, the light rail which is still cheaper than the heavy rail of the South African Transport Systems in Dusseldorf.

#### DR NAUDE VAN WYK: NEERI

U het in die vorige skyfie gesien dat selfs in stil ou rustige Pretoria, hoe die motorkarre oopen hoop.

Ek wil baie kortliks in 'n paar minute vir u, een of ander vertel in verband met die werk wat in Suid-Afrika gedoen is. U is almal bewus, ek het dit vantevore al aan u voorgedra, van die projek wat ons in 1977 gesamentlik met 'n konsortium in Wes Duitsland gehad het waar ons twee voertuie hier evalueer het. Hierdie twee voertuie het gesamentlik meer as 100 000 kilometer afgelê en in die agt jaar het die Volkswagen, met twee stelling-batterye gebruik. Die voertuie is almal nog in 'n bruikbare toestand en word nog gebruik, maar die batterye begin nou die einde van hul lewe bereik.

'n Baie interessante nuwe ontwikkeling deur mnr Jurgens, van die befame familie van karavaanvervaardigers is die mikro bus waar gebruik word van hulle kundigheid om op die gebied van lae massa onderstelle en saamgestelde materiale vir die bakwerk wat natuurlik baie sterk is. Dit is 'n nuwe benadering want die meeste ander batterye voertuie is gebou op onderstelle van normaalvervaardigde voertuie, en hierdie busse kan 15 persone vervoer en teen 50 kilometer per uur is die ritafstand met loods-batterye ongeveer 73 kilometer. Dit verteenwoordig so iets soos 58 kilometer in die stad.

Die volgende voertuig wat u hier sien, is 'n Suzuki en dit is toegerus met die Zebra batterye wat in Suid-Afrika ontwikkel is. Nou u het heelwat in die Pers daarvan gelees. Daar is baie min inligting beskikbaar oor hierdie batterye om baie voor-diehandliggende redes. Hierdie Suzuki het 250 kilometer teen 'n konstante snelheid van 44 kilometer per uur op een lading afgelê met die spesifieke batterye en in 'n baie onlangse toets wat ons gedoen het, 240 kilometer teen 55,5 kilometer per uur. Omgerek in stads toestande sal dit vir ons 'n ritafstand van ongeveer 100 na 150 kilometer gee. Met loodsurbatterye sou die afstand teen konstante spoed, iets soos 'n maksimum van 100 kilometer geweet het en in stedelike verkeer 60 kilometer.

Nou hoe lyk die batterye? Hier sien u 'n foto van een van die batterye voor die toets installasie. Dit is 'n hoë temperatuur batterye, teen 250°C. Hierdie spesifieke een wat u hier sien het omtrent 'n energieinhoud van 40 kilowatt uur en 'n spanning van 90 volt. Die energie digtheid in hierdie batterye is ongeveer 66 watt uur per kilogram. Dit kan u vergelyk met die beste loodsurbatterye van ongeveer 26 watt uur per kilogram.

Die werk gaan voort en oor die volgende twee jaar is die mikpunt om die energie digtheid op te stoot na 'n 100 watt uur per kilogram. Nou u kan self dink wat dit aan die ritafstand gaan doen.

Nou hoe werk die batterye? Soos ek sê daar is min bekend en as u nou vir my vasdra dan kan ek altyd die verskoning gebruik dat ek nie mag sê wat dit doen nie, maar dit is waarsynlik omdat ek nie presies weet hoe die ding werk nie.

Die volgende is van dieselfde familie as wat die natrium swael batterye is. As u aan die linkerkant, die buitekant begin, dan het jy dieselfde sagte staalbuis waarin die hele ding gehuisves word. Kom ons gaan van die regter kant af in, dan sal u sien daar is iets wat beskryf word as Beta Alumina. Dit is 'n keramiese buis, soliede materiaal. Die materiaal het die eienskap dat by die temperatuur van 250°C kan natrium ione daardeur gaan. Hy is wat ons noem 'n soliede elektroliet en dit is wat nuut is in die Zebra batterye.

Daar is 'n volgende elektroliet en dit is 'n gesmelte soute-natrium aluminium-kloried en deel van daardie gesmelte soute is binne in 'n matriks. Dit is 'n keramiese koolstof materiaal wat of, yster-koolstof of nikookoolstof bevat. Reg in die middel is die stroom-

kollekteerder wat in die een geval yster sal wees of in die ander geval nikkel sal wees.

Dit is die enkel sel, ek herhaal dit werk teen ongeveer 250°C. Dit verskil van die natrium swael batterye wat dieselfde soort van energiedigtheid het, deurdat dit geen swael bevat nie en basies is die aktiewe materiale natrium kloried, gewone tafelsout, en yster. Dit is hoe eenvoudig dit is.

Wat is die voordele van hierdie spesifieke batterye? Eerstens werk dit teen 250°C in plaas van die 350°C vir die natrium swael. Dit het 'n hoër selspanning per sel, 2,35 volt instede van 2,08 volt in die geval van natrium swael. Dit is minder aggressiewe materiale. Gesmelte swael is 'n baie korrosiewe materiaal en dus kan hier voordeel normale staal gebruik word instede van vleklose staal of iets anders in die natrium swael met dieselfde energie digtheid as die natrium swael batterye, 100 watt uur per kilogram, en soos ek gesê het, goetkoop materiaal. Die verwagting is dat dit in massa vervaardig kan word teen ongeveer 'n R100 per kilowatt uur.

As u dit vergelyk met die laaste traksie batterye wat ons vir ons voertuie gekoop het, wat ek vir u in die begin gewys het, omtrent vier jaar, vyf jaar gelede, het ons R300 per kilowatt uur betaal. Nou hierdie batterye sal en ek het geen twyfel daaroor nie, 'n groot inslag maak nie net en hierdie voertuie 'n nuwe lewe te gee nie, maar dit gaan ook 'n groot rol speel in piekafplating in die elektrisiteitsvoorsienings bedryf.

Laastens dan, miskien kan ons wel ontslae raak van 'n klomp van ons voertuie wat gasse uitblaas in die stede. Hier is 'n voorbeeld van 'n voertuig wat in Duitsland op die oomblik vervaardig word. Jy kan hom koop teen 40 000 Deutch Mark, dit is so in die omgewing van R35 000 en sy rit afstand is 60 to 80 kilometer met loodsurbatterye. Maksimum snelheid ongeveer 115 kilometer per uur.

Ek wil my dus self verstout om te sê dat met die nuwe batterye wat nou tevoorskyn kom, dat ons 'n totale heriewing gaan kry van die batterye aangedrewe voertuie. Baie dankie mnr die President.

#### MR RA LEIGH: JOHANNESBURG (WRITTEN CONTRIBUTION)

Mr President, a paper on Electric Transportation cannot fail to stir the blood of any true Electrical Engineer and the authors are to be sincerely congratulated for another fine effort on their part. They have both played a valuable roll in keeping us all updated in the developments in this field as well as contributing to the ongoing research.

Those involved in transport in a large city know the problems of the present proliferation of small vehicles only too well. The goal to replace the daily influx of private cars to the city from the White areas by some form of public transport, has consistently eluded transport planners. Now the transition from the use of buses and trains to the minibus means that a similar problem is establishing itself in the Black areas.

The need to urgently market the use of public transport is evermore urgent and can hardly be passed around between various forms of government like a hot potato for much longer.

One must agree with the author's analysis of the fuel and fuel oil scene both world wide and local. One of the most misleading arguments put forward by operators of diesel engine transport is that their operations accounts for only 5% of diesel fuel used.

Obviously, if public transport does show the desired improvement this factor will rise appreciably and approach 25% of the increased use of diesel.

Scarcity, foreign exchange and pollution are all factors which should be giving impetus to the development of urban electric transport.

Unfortunately due to the lack of electric trolley buses from world suppliers large municipal transport departments are comparing the life of modern diesel buses (20 years) with trolley buses bought in the 1950's, which also gave 20 years, but due to manufacturers disinterest spares became difficult to obtain and

expensive. It seems that a true comparison between modern diesel and trolley buses does not exist. Past comparison is also clouded by the development of the local diesel engine industry and consequently less reliance on imported components without the balancing local manufacture of electric vehicle and overhead track components.

The authors analysis of the relative costs of electric and diesel transport cannot be disputed and surely the results in Tables 3 and 4 must make an impact on city transport managers.

The conclusions and recommendations of the "Mass Transit Committee for Johannesburg" appointed by the Minister of Transport Affairs in 1983 indicated that present transport systems can at best only cope until the year 2000 if SATS are permitted to make continuous improvements, but, that "it is unavoidable that Johannesburg will have to prepare itself for a rail-based mass transit service by the year 2000".

At that time the cost was estimated at R500 m for a single starter line and approximately R1 600 m for a complete system.

The committee further recommended that:

1. The Cabinet be informed of the extent and implications of the mass transit problem in the Johannesburg Metropolitan Area.
2. The Central Government should become involved financially in a comprehensive feasibility study in respect of a mass transit system for the area.

Unfortunately there were no positive developments in this respect and the problems remain to be tackled. Buses cannot continue to cope and a grade separation of public and private transport remains essential for a faster and reliable service, free from congestion.

In respect of trolley buses the Johannesburg Trolley Bus Demonstration Steering Committee Project while entered into with great hope, did not do justice to electric buses.

Problems which bedeviled the project were:

1. Each bus was virtually a prototype and was supplied by a different company. As can be expected of any prototype these gave a variety of operating failures which one would expect to be ironed out in the development stage by any manufacturer before production. It does not seem that due allowance was given and the demonstration should have been extended to introduce improved models.
2. As could have been expected, manufacturers were very keen to demonstrate their latest technology. This resulted in systems which were unnecessarily complex. Simpler and more proven systems would have given a better demonstration of what was really the object of the demonstration. The economics of trolley bus operation.
3. The extra tare weight of auxiliary power units resulted in a loss of 20 of the 110 passengers carried on the diesel engine chassis. As can be expected ability to meet peak demand versus capital invested, taken together with driver's wages results in reduced viability. In this respect a two axle double-deck trolley bus has a distinct advantage.
4. The demonstration project was run over old track equipment and routes were therefore not adjusted to give optimum results from trolley buses.

As far as articulated single-deck units were concerned, these proved unpopular due to the high number of standing passengers who are used to private car comfort. They are obviously unsuitable in large numbers in an already choked Central Business District.

Other results from the investigation are:

1. On energy comparison, the trolley bus is twice as energy efficient as a diesel bus (ESCOM vs SASOL).
2. Speed, acceleration and gradient ability favours the trolley bus.
3. The trolley bus with no emergency drive is at a disadvantage and a lack of flexibility where there are no dedicated busways is its major drawback.

4. As a result of emergency drives, chassis capacity must be upgraded to 110 passengers.
5. A minimum fleet size is computed to be 35 vehicles.
6. The cost (1984) of 72 electric vehicles (capital and operating but excluding capital cost of O.H. system) was about R7.1 million (i.e. 25% more than the equivalent diesel bus system.
7. A transport system using 35 trolley buses fitted with a VW emergency drive would require a grant of R6.7 million to be viable in Johannesburg, equivalent to R176 000 for each new trolley bus, or 67% of the 1983 price of R261 400 for such a trolley bus.

Unfortunately Johannesburg decided not to pursue the trolley bus project and as visitors will have noticed the overhead system, first installed to Orange Grove in 1936, is being pulled down. This seems a tragedy as it was the last remaining O.H. track system which could have served for future testing in South Africa. Now, not even the beautifully restored AECI bus used in the City's centenary year can run.

Thus the end of an era of electric vehicles in Johannesburg which started with the early trams, but, it is my conviction that electric traction will return and the valuable part being played by men such as Drs Anderson and Van Wyk will hasten that day for which I again sincerely thank them, and the teams that support them.

In conclusion, Mr President may I add my own appreciation to the authors for a most interesting paper.

#### MR C ADAMS: PORT ELIZABETH

Mr President, I am pleased to be able to join in the discussion on this paper by Drs Anderson and Van Wyk, as Port Elizabeth is one of the cities actively promoting a light rail transit system.

Ek vind die gekwoteerde syfers uiters interessant, omdat hulle sonder twyfel die wenslikheid van elektriese transport bewys. Uit hierdie syfers blyk dit duidelik dat dit baie voordelig is om elektriese krag te verwerk en dit in voertuie te gebruik as om petroleum uit steenkool te vervaardig vir dieselfde doel. Die tekort aan geskikte elektriese voertuie is skynbaar die grootste struikelblok, en my eerste vraag aan die skrywers is: Dink hulle nie dat meer geld aan navorsing in die rigting van die vervaardiging van 'n prototipe elektriese voertuig bestee moet word nie?

The reason I ask this question is because I wish to challenge one of the assumptions made in the paper. Having given statistics to prove that electric transport is more efficient, the authors accept without question the conclusions of one of the references they quote, that light rail transit is the way to go. Figure 6, which shows the cost per passenger km plotted against passengers per peak hour, shows mini-buses as the most expensive, with new heavy rail the cheapest, and the authors then go on to accept that the proposed light rail transit system is the best option.

In my opinion this is the wrong approach. On page 8 of the paper the authors quote statistics on the rate of increase of motor vehicles, and quote a rate of increase of mini-buses as between 8 and 12.5% per annum. As they say, and I quote: "The fact that this trend is happening illustrates that the passengers are prepared to pay more for a quick and frequent service . . ." unquote. If that is what people want, and are even prepared to pay more for it, why don't we develop an electric mini-bus which will have the desired efficiency, and be better patronised because they are more convenient.

Die argument teen die gebruik van mini-bussies is dat hulle opeenhoping van verkeer op die paaie sal veroorsaak. Die ligte spoorwegvervoerstelsel wat vir Port Elizabeth beplan word, sal dieselfde nadele besig omdat dit vir 'n taamlike afstand in die hoofweg, wat reeds 'n besige verkeersweg is, sal afaan en sodoende die beskikbare ruimte vir ander voertuie heelwat sal verminder.

Die kapitaalkoste vir die Port-Elizabeth-stelsel is beraam op R150 miljoen. Daarbenewens sal die Regering dit met 'n aansienlike subsidie moet aanpaa. Wat dink die skrywers van j

voorstel dat hierdie geld baie voordeliger bestee kan word in die ontwikkeling van 'n elektriese mini-bus wat die verlangde vervoer sal verskaf, en wat heel moontlik nie gesubsidieer hoef te word nie.

Nietemin, indien ons aanneem dat voorkeur aan ligte spoorvervoer gegee gaan word, hoe gaan dit ons as munisipale elektriese ingenieurs beïnvloed?

Die twee aspekte wat ons mag raak is eerstens die oprigting en instandhouding van die kettlinging, en tweedens die voorsiening van elektriese krag aan die stelsel.

Oorhoofse kragstelsels vir elektriese vervoer is 'n hoogs gespesialiseerde gebied waarop baie min plaaslike owerhede enige ondervinding het. Indien 'n munisipale elektriese departement betrokke sou raak in die instandhouding van hierdie toerusting, sal 'n hele reeks vaardighede ontwikkel moet word. In Port Elizabeth werk ons op die veronderstelling dat die spoorvoorsieningsmaatskappy vir die instandhouding van so 'n stelsel verantwoordelik sal wees en dat ons nie daarby betrokke gaan raak nie.

The supply of power will definitely be our responsibility however. The system proposed for Port Elizabeth will be a Y shaped system, starting in the CBD, running down Main Street for about 5 km to a point where it splits, the one arm of the Y running into the Coloured township and the other into the Black townships. The length from CBD to the terminus will be about 20 km in each case. The voltage on the catenary will be about 650 volts, which would normally require traction substations at intervals of about 1,5 km. The total track length of  $\pm 30$  km would thus require about 20 substations.

Normally, this would present no problem, the line would run through a reticulated area and the substations could be cut into the existing 11 kV network. This arrangement would however be unacceptable as far as reliability is concerned. If a cable fault should occur at least one of the substations would be without power for a period of 30-60 minutes while the faulty section is isolated and the alternative supply switched in. If one section of the track is without power, a number of the cars would have to be brought to a standstill for safety reasons, which would, if it occurred near peak time, cause considerable inconvenience to 3 000-4 000 commuters.

The challenge is thus going to be to design the power supply to the system in such a way that a very high reliability will be attained at an acceptable cost.

One way might be for each traction substation to be supplied from two separate rings with automatic changeover from one to the other. This will solve the problem as far as cable faults are concerned, but not for the condition where a large section of the city is off due to load shedding caused by Eskom faults. This condition is in fact the one more likely to occur, and is not so easily solved. Have the authors any opinion on this question of the reliability of the power supply?

Mr President, as you can see, we will have an interesting problem to think out, and hopefully we can find a solution which other municipalities might benefit from. I would therefore like to thank the authors very much for this very interesting paper. Thank you.

#### DR RALPH ANDERSON:

Just a very quick reply. Obviously in the time we had to present this paper, we weren't really able to go into this matter very deeply as far as public transport systems were concerned, but the South African Transport Services usually requires a ridership of the order of 40 000 in the hour and there is a big space between buses and trains which could be filled by cheaper transport, namely either trolley bus systems which are cheapest up to light rail which can vary from almost like trams up to a very sophisticated light rail and finally into the South African Transport System.

I don't think mini-buses will be the answer at all, because we are talking about congestion in systems and congestion is one of the things one has to get rid of. I think, however, that the idea of

battery driven vehicles can solve many of these questions. A trolley bus, or a train even, with a battery system back-up will be able to move, when the power system fails and will be able to move off-route in the case of the trolley bus if necessary. So I think we must look to the next ten years to see great developments in the application of the new battery systems to our traction systems of today, to solve our problems. Thank you.

#### R Bailey: Affiliate

The paper read by Dr. Anderson and Dr. van Wyk is obviously based on well researched facts and clearly defines the issues to be considered when planning transportation needs for the future. Dr. Anderson and Dr. van Wyk are to be congratulated for the concise and detailed manner in which the paper has been presented and it is sure to give food for thought to our Traffic Planners and Engineers.

With the changing policy of S.A. Transport Services, to subsidising the cost of future suburban heavy rail services and their stipulated minimum peak hour patronage of 40 000 persons, local authorities are reassessing their options for future passenger transportation requirements in their areas. A number of major South African cities are currently studying future requirements for commuter services and Light Rail Transit systems could well provide a cost effective solution. Since light rail transit systems are new to South Africa and will involve the Municipal Electricity Undertakings it is opportune to give a short insight into this mode of transport.

Light Rail Transit (LRT for short) has emerged in Europe and the United Kingdom as a development of former tramway technology employing steel wheel to rail electrically propelled vehicles which predominantly, but not necessarily exclusively uses segregated track.

Being flexible in its concept the running track can embrace sections of existing railways, sections of highways, and possible existing bridges, viaducts etc. from earlier tramway systems. Hence a resulting network can embrace a greater area of a city than can be justified by other systems and is readily adaptable to being integrated with a bus feeder network. Light rail has developed in many cities as a more cost effective approach to providing a rail transport solution to a situation where frequent service and high average speeds are required and where traffic densities are not high enough to justify a mass transit system. A Light Rail Transit System can readily provide a complex network and can sustain existing urban development pattern especially in high density areas or provide support to a new development.

The main advantage of LRT derives from a lower cost to build per kilometre over other systems. LRT is far cheaper to construct than a conventional railway as the small, lightweight vehicles can handle steeper gradients and tighter curves than normal trains, requiring less land and reducing the cost of structures such as bridges. The value of the turnkey project to construct the first phase of the recently completed Docklands Light Railway in London was £60 million. The estimated cost of constructing to conventional railway standards including the extensive use of tunnels was over £400 million.

The Docklands Light Railway was opened to the public on 1st September, 1987 and the fully operational 12 km system was completed in 30 months. Further extensions to the system will be built and the cost of these extensions will be paid for by the enhanced value of land in the areas served by these extensions.

Aesthetically designed light rail vehicles generally take the form of a two section 6 axle or three section, 8 axle articulated unit. Capacity is normally between 150 to 250 passengers with an unladen weight of the order of 35 to 42 tons.

Very stringent standards are now being laid down for noise levels both internal and external to the vehicle with typical external levels below 75 dBA. This is achieved by extensive use of rubber in the wheel construction, bogie spring design and the traction/gear box drive. Insulation and sound deadening material is also used in the vehicle body design.

The new generation of microprocessor controlled gate turn-off thyristor propulsion and static inverter equipments, now powering light rail vehicles have significantly improved the overall efficiency. A blended rheostatic and regenerative braking system enables power to be fed back into the system to supply other vehicles on the track. Dependent on the mode of the other vehicles i.e. accelerating, coasting or decelerating, this type of braking can reduce the overall propulsion energy consumption by 40 to 50%. These features show meaningful reduction in the operating costs of a LRT system. The standard of ride provided by modern L.R. vehicles is a great improvement over current suburban trains and should be able to attract additional passengers.

As stated in Dr. Anderson and Dr. van Wyk's paper any form of future metropolitan transport will require dedicated and possibly segregated routes if it is to have any chance to beat the congested motorised transport system. This inflexibility must be

offset by other advantages, which in the case of light rail can be listed as competitive fares, timeous and uninterrupted journeys as well as a quiet, vibration free and (if necessary) air conditioned ride. LRT is readily adaptable to being integrated into a composite traffic plan with timetabled interaction with heavy rail, buses, mini bus and cars.

The case for light rail traction has been helped in recent years by significant developments in the design of the vehicle, current collection system and propulsion systems. Experience has proved that LRT can both attract and build up traffic whilst relieving vehicle congestion in city centres and offers scope for environmental improvements unobtainable with other means of surface transport.

Once again many thanks to Dr. Anderson and Dr. van Wyk for a most enlightening paper on a topic that is already becoming a very real issue in South Africa today.

## KLANTEDIENS IS EVKOM SE WAGWOORD

J L Rothman, Senior Hoofbestuurder van Evkom



Mr Lood Rothman, Senior Hoofbestuurder van ESKOM.

### PRESIDENT: Introducing Mr AL Rothman:

Mr Rothman went to school in Vrede in the Free State and obtained his B.Sc. Electrical Engineering Degree at the University of Stellenbosch. He started work as Junior Test Engineer and then Assistant Engineer in the Electrical Test Department of the Rand Undertaking of Eskom. After about a two year spell he left Eskom and joined the Town Councils of Vrede and Ficksburg as Town Electrical Engineer. After this he rejoined Eskom and has been with them ever since and presently holds the position at Eskom Head Office of Assistant Chief Executive. Lood is the holder of the Electrical Engineers Certificate of Competency and is also a registered Professional Engineer. Besides this he is also an associate member of "Die Suid-Afrikaanse Akademie vir Wetenskap en Kuns". Before asking Mr Lood Rothman to come forward, I would like to tell you the following little story which, on a previous occasion at the opening of a SANCI Congress in East London, the then mayor, Mr Jasbeck, told the delegates from an ex-Eskom consumer. It goes something like this:-

"He stood before the pearly gates, his face was scarred and old".

"He meekly asked the man of fate, admission to the fold",

"What have you done.", St Peter said, "to gain admission here?"  
"I was a consumer of Eskom, Sir, for many and many a year."  
The pearly gates swung open wide, St Peter touched the bell,  
"Come in," he said "and choose your harp, you've had your share of hell."

### MNR AL ROTHMAN: ESKOM

Mnr die President, u weet, ek kan nie help nie maar ek moet op daardie opmerking reageer. U weet dit is seker die rede hoekom julle nou vir my gevra het om in hierdie begrafnisuur vir u te kom toespreek.

U weet dit laat my dink aan een van ons ou predikante wat eendag vir my gesê het, toe dit nog die gebruik was om ook Sondagmiddag diens te hou na nagmaal dat dit hoog tyd is dat die kerkrade besluit om nie kerk te hou op so 'n onchristelike uur nie. Mnr die President by wyse van inleiding wil ek eerstens net verskoning aanbied vir ons Voorzitter, mnr John Maree, wat nie hier kan wees nie maar in die buiteland is by die IMF finansiebesprekinge en het my toe gevra om namens hom 'n paar woorde oor Eskom te kom vertel. Ek wil dan ook sy gelukwensing en ook ons gelukwense aan u persoonlik en aan u organisasie oordra vir die goeie werk wat u doen en baie sukses toe wens met hierdie Konvensie. Ek wil ook vir u sê dit is nie vir my vreemd om hier te wees nie, want ek herinner my as Munisipale Ingenieur aan die eerste konvensie wat ek in die jaar 1954 bygewoon het en as ek so rondkyk dan kan ek my net vernig herinner aan een van die lede wat ek met van die geleentheid nog onthou en dit was ons vriend Les Smith van Boksgburg, u voorganger. En as u nou praat van die hel wat julle mense het met Eskom dan wil ek darem ook net verwys na die woorde van die Burgermeester gister wie gepraat het van die prys van elektrisiteit in die jaar 1906 van 10c per eenheid in vergelyking met die uifers gunstige prys van 8c per eenheid vandag dan vra ek vir u, "waar is die hel van inflasie wat julle getref het?"

Baie dankie vir hierdie gewaardeerde geleentheid om u in te lig oor ontwikkelings in Evkom en ons planne vir die toekoms.

Uit die aard van ons bedrywighede, het Evkom en die VMEQ 'n lang verbintenis wat in 1985 amptelik geword het met die aanstelling van mnr PJ Botes as u verteenwoordiger in die Elektrisiteitsraad.

Die raad van 20 lede is, soos u weet, die beleidvormende liggaam in Evkom, en verteenwoordig al ons groot klante en belangegroep. Ek is verheug om te kan sê dat die verhouding tussen die raad en Evkom se bestuursraad die afgelope twee jaar verstewig het.







# Human energy: a major source of electrical energy.

Any chief executive of a large company will understand the enormous complexity of co-ordinating 60 000 employees and an annual turnover of nearly R5 000 million. In addition, Eskom is over 60 years old and is the sole supplier of 94 percent of South Africa's electricity. It's a situation that could invite complacency and bureaucracy.

Aware of these problems, Eskom's management has launched the most dramatic restructuring programme ever undertaken by a major South African company. It involves the optimum use of human energy by creating an atmosphere of enthusiasm, commitment and dedication amongst employees at all levels. By encouraging employees to voice their ideas of how improvements can be made within their own departments, combined with wide-spread initiatives by management, dynamic solutions are being generated on cost-saving, better service to customers and general efficiency.

From this programme, it is expected that millions of Rand can be saved each year, which will be translated into lower tariff increases. Already, electricity from Eskom is among the cheapest in the world – despite the difficulties experienced in generating and distributing electricity throughout a country as vast as South Africa.

But we're not using the rest of the world as a criterion. Our concern is the role we have to play in the economic advancement of South Africa. We are intimately involved in the well-being of the public, of industry and agriculture, and in preserving our natural resources and the environment. This means that our efficiency affects not only our credibility with customers and investors, but also the future of our country and its people.

And that is why human energy – from management, and throughout the entire organisation – has become as important to us as the energy we sell.



**ESKOM  
EVKOM**

**Energy for Africa.**

Die stigting van die Elektrisiteitsraad was natuurlik net een van die baie veranderinge wat sedert die middel van 1985 in Evkom geïmplementeer is. Hierdie veranderinge is breedvoerig bespreek gestel, en dit is nie nodig om hulle vandag in detail te beskryf nie. Miskien moet ek egter kortliks die soeklig laat val op die vordering wat met ons desentralisasieprogram gemaak is, want dit het veral betrekking op die VMEQ.

Die basiese motivering vir desentralisering was die behoefte om nader aan ons kliente te beweeg. Ons het gevolglik die getal distribusiestreke van 6 to 12 vermeerder, en het sowat 60 distrikte in daardie streke gestig.

Dit is op die distriksvlak dat Evkom werklik daaglik met die gebruikers van ons produk in aanraking kom, en vir baie mense is die distrikbestuurder mnr Evkom.

Ná hierdie aanbieding sal tyd afgestaan word om u vrae te beantwoord en na u kommentaar te luister. Dit is vir ons baie waardevol om terugvoering van u te kry oor hoe effektief daardie verhouding is.

Nog 'n belangrike ontwikkeling was natuurlik om die beheer oor ons finansies verder te verskerp, met die gevolglike voordele vir u in die vorm van kleiner prysverhogings.

'n Ontslaglike hoeveelheid werk is die afgelope twee jaar in hierdie verband gedoen. Dit was as gevolg van die skuldstilstand dat ons gedwing is om noulettend na ons toekomstige finansiële behoeftes en geldbronne te kyk. Die inspirasie het ook gekom uit die erkenning van die feit dat 'n organisasie wat dit vir homself ten doel gestel het om 'n voortreflike sakeonderneming te word – soos wat Evkom gedoen het – eers na sy finansiële prestasie moet kyk.

Daar is waarskynlik nie 'n beter aanduiding van die welstand van 'n sakeonderneming en die professionalisme van sy bestuur as 'n gesonde balansstaat nie.

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This upgrading will have to break away from conventional restraints and will have to be characterised by massive innovation if we are going to turn challenge into opportunity. The sheer magnitude of what has to be done is staggering in dimension. We dare not think only of what is now needed. We have to think of the harsh demographic realities of tomorrow.

There is an existing adult population migrating to urban areas, but future migration will not be simply more of the same kind of migration. It will be so quantitatively different that it will in fact become qualitatively different. Right now more than half of all Black South Africans are 15 years old and younger. This huge population bulge of many many millions could amount to a veritable human tidal-wave of problems if we do not sit down now to do some hard, sober thinking. We must think about how we are going to accommodate the human requirements for millions upon millions of youths moving towards the market place at a rate much faster than the steps that are being taken to accommodate them.

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Ons uitvoerende hoof, Ian McRae, het by geleentheid gesê die behoefte is groot, en as die land nie begin om daarin te voorsien nie, sal groot dele van ons bevolking permanent sonder elektrisiteit wees.

Hy het 'n syfer van 20 miljoen mense genoem, 3 miljoen wat hulle in stedelike gebiede. Maar daar kan verwag word dat hierdie 3 miljoen in die jare wat voorle dramatiese kan groei, want Suid-Afrika volg die wêreldwye patroon van massiewe verstedeliking.

Sonder toegang tot elektrisiteit word daardie groeiende stedelike bevolking gedwing om voortdurend in armoede en swak omstandighede te lewe.

Andersyds kan elektrisiteit die vonk wees wat algemeen stedelike hernuingsprogramme aan die gang sit en terselfder tyd hierdie mense in staat stel om hulle leefwyse te verbeter en met hulle eie tuinsywerhede te begin.

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sowat 60 Swart woonbuurtes is, elk met sowat 5 000 persele. As geskikte tegnologie gebruik word en sowat R50 miljoen tot R100 miljoen per jaar bestee word, kan dit 'n merkbare uitwerking op stedelike elektrifisering hê.

As ons die elektrifiseringsprogramme in dieselfde tydperk na die platteland uitbrei, styg die koste tot sowat R300 miljoen per jaar. Dit is natuurlik 'n aansienlike bedrag.

As alle belanghebbendes eger finansiële bydra, kan hierdie doelwit bereik word. Met betrekking tot finansiële en ander oorwegings moet dit beklemtoon word dat Evkom nie met so 'n projek kan of wil begin sonder die noue samewerking en steun van plaaslike owerhede, die openbare sektor, private ondernemings en ander verskaffers, waar van toepassing, nie.

In hierdie verband is die basiese vereiste dat alle belanghebbendes die uitdaging aanvaar. Verbodigryke denke sal ook nodig wees. Dit moet gegrond wees op die besef dat ons moet weg beweeg van ons tradisionele benadering tot die verskaffing van elektrisiteit as die beperking op koste en tyd oorbrug moet word.

Ons moet dus kyk na die beter benutting van gepaste stelsels soos bogronde geleiers, paaltransformators, die bedrading van huise en vooruitbetaalde of begrotingmeestelsels.

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There is of course a further dimension which we recognise. That is, electrification, to be effective, cannot simply take place in a vacuum. In other words, if we are going to find simple solutions to electrification we should at the same time find equally simple solutions to the upgrading of the townships themselves.

Escom has done considerable research in this area too, primarily as a result of our involvement in the Alexandria urban renewal project.

But here again, urban renewal is not our business and in order for this strategy to succeed, involvement will have to come from government, local authorities and private institutions.

I am happy to say that as a result of the publicity which followed a recent press conference in Johannesburg addressed by Ian McRae, we have had a very heartening response from a wide variety of areas. It is clear that many people in our country recognise the urgent need to both upgrade and electrify disadvantaged urban and rural townships, and the prospects of launching a significant programme in the near future are very exciting.

We would certainly value your comments, suggestions and assistance. Many of you will be in the front line of such a programme and your commitment is vital to its success.

Perhaps we could take the next few minutes to assess your views, in general terms, on what I have outlined.

Die raad van 20 lede is, soos u weet, die beleidsvormende liggaam in Evkom, en verteenwoordig al ons groot kliente en belangegroep. Ek is verheug om te kan sê dat die verhouding tussen die raad en Evkom se bestuursraad die afgelope twee jaar

verstewig het.

Die stigting van die Elektrisiteitsraad was natuurlik net een van die baie veranderings wat sedert die middel van 1985 in Evkom geïmplementeer is. Hierdie veranderings is breedvoerig bekend gestel, en dit is nie nodig om hulle vandag in detail te bespreek nie. Miskien moet ek egter kortliks die soekling laat val op die vordering wat met ons desentralisasieprogram gemaak is, want dit het veral betrekking op die VME0.

Die basiese motivering vir desentralisering was die behoefte om nader aan ons kliente te beweeg. Ons het gevolglik die getal distriktusstreke van 6 tot 12 vermeerder, en het sowat 60 distrikte in daardie streke gestig.

Dit is op die distriktusvlak dat Evkom werklik daaglik met die gebruikers van ons produk in aanraking kom, en vir baie mense is die distriktbestuurder mnr Evkom.

Ná hierdie aanbieding sal tyd afgestaan word om u vrae te beantwoord en na u kommentaar te luister. Dit is vir ons baie waardevol om terugvoering van u te kry oor hoe effektief daardie verhouding is.

Nog 'n belangrike ontwikkeling was natuurlik om die beheer oor ons finansies verder te verskerp, met die gevolglike voordele vir u in die vorm van kleiner prysverhogings.

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#### PRESIDENT:

Dr Botha sal u asseblief op die toespraak van mnr Rothman reageer.

#### DR NICO BOTHA: BLOEMFONTEIN

Die Kommissie van Onderzoek na Elektriesiteitsvoorsiening vir Suid-Afrika – (1984 verslag) was oortuig dat Eskom se rol oorwegend die van 'n grootmaatvoorsiener behoort te wees en alleen dat die rol van plaaslike owerhede in die bedryf in die algemeen ongesteur gelaat behoort te word.

Ek is 'n voorstaander daarvan dat ons elektrisiteit beskikbaar moet stel aan soveel mense as moontlik.

Ek het ook begrip daarvoor dat Eskom baie geld aan Kragentrales en kraglyne bestee het en gevolglik hierdie bates ekonomies sou wou bedryf. Ek het derhalwe ook begrip daarvoor as Eskom nuwe markte sou wou ontgin.

Mnr die President ek neem die afgelope tyd nuwe inisiatiewe by Eskom waar. Hierdie inisiatiewe is veral op die bemarkingsgebied. Ek is huiwerig om dit te sê maar ek is van mening dat Eskom soms op plaaslike Bestuursvlak bemerkend doen.

Ons leef vandag sover plaaslike bestuur en Streeksdiensere aanbetref in onsekerer tye. En ons is nie presies seker wat Eskom se rol in die verband is nie. Ons weet dat 'n mens deur politici soms gedwing word om dinge te doen wat jy nie graag wil doen nie.

Plaaslike bestuur word vandag van alle kante bedreig, om wil derhalwe nie graag Eskom ook as 'n bedreiging sien nie.

Kan meneer Rothman ons vandag die versekering gee dat klein-maat elektrisiteitsvoorsiening sover Eskom aanbetref let ek ek sê sover Eskom aanbetref, ongesteur gelaat gaan word.

#### MNR DU TOIT: SOWETO

Meneer die President ek wil mnr Rothman se standpunt beklemtoon dat daar 'n groot leemte is met die elektrifisering van swart gebiede. Die behoefte bestaan beslis maar soos dr Botha het ek ook bietjie van 'n probleem oor wie die werklike elektrifisering moet hanteer en dan meer so nadat hierdie plekke elektrifiseer is en soos u weet, het ons in Soweto selfs die onderverdeling gehad het, dit is nou alles mooi en wonderlik en die nuwe stelsel is daar maar wat dan? Met ander woorde dit is miskien in 'n mate ook waar die VMEQ 'n rol kan speel by die verdere bedryf en verdere ontwikkeling van hierdie stelsels. Daar is 'n groot tekort aan opgeleide mannekrag en hierdie elektrifisering skep natuurlik nog 'n groter behoefte vir meer opgeleide mense wat nie op die oomblik daar is nie. Natuurlik is daar ook sekere opleidingsimplikasies en sekere ander komplikasies. Die feit van die saak is egter dat op die huidige oomblik is daar nie mense beskikbaar om hierdie stelsels te bedryf nie en in 'n baie kort tyd kan so 'n stelsel verwaarloos en amper tot niet gaan om dit so uit te druk. Ek wil dus net miskien aandui dat die VMEQ moontlik deurmiddel van naburige stadsrade na die verdere bedryf en ontwikkeling van hierdie stelsels kan kyk. Net 'n laaste puntjie. Dr Botha het ook verwys na die bemarkingsveld. U weet ons het al sekere probleme ondervind, en ek weet nie of dit aan die deur van die media gelê moet word nie en of dit nou werklik van Eskom afkom nie. Daar is stellings gemaak en om in Engels te kwoteer "half price electricity" en groot verwagtings wat daar nou by sekere bestaande stadsrade geskep word dat elektrisiteit nou in die toekoms baie goedkoper gaan wees. Ons het klaar 'n probleem met ons rekeninge om die koste van elektrisiteit in perspektief te plaas en dit skep weer ander probleme vir ons. Dankie meneer President.

#### MNR P ERASMUS: SECUNDA

Mnr Rothman het 'n melding daarvan gemaak dat die verhogings nie vir ons in die toekoms skokke sal inhou nie maar die afgelope ses jaar het Eskom se tariewe met 150% toegeneem. Nou ek wil net graag verneem of daar enige strategie is om die tarief verhogings onder die inflasiekoers te hou want my Stadsraad is al reeds bekommerd oor die groot toename in tarief verhogings. Baie dankie.

#### MNR DIRK JORDAAN: VERENIGING

Mnr President ek wil net aansluit by die aangewese President, Dr Nico Botha, nie net wat die kleinmaat voorsiening van elektrisiteit betref, maar ook wat die grootmaat voorsiening van elektrisiteit binne 'n Stadsraad se voorsieningsgebied betref wil ek 'n vraag aan mnr Rothman stel. Wat is Eskom se huidige beleid daaromtrent en hoe gaan dit in die toekoms die prys van elektrisiteit aftekeer en dan ook miskien wat Eskom se rol ten opsigte van die Streeksdiensere in toekoms sal wees. Dankie.

#### CLR VAN DER BIJL: VERWOERBURG

I would just like to emphasise what Mr Rothman has said with regard to the challenge which lies before us as a country to provide facilities and in this case, electricity, for the increasing population. The figures show that the Black population is going to increase at a tremendous rate whereas amongst Indians, Whites and Coloureds not so fast. If the present Black population is 25 million, in the year 2010 it will be 50 million and in the year 2035 it will be 100 million. In other words it is doubling up in less than a generation each time. That is the challenge which lies before us and I would support Mr Rothman in his suggestions and hope that we will be able to find a solution in coping with the electrification we have and are going to have in the years in the future.

#### COUNCILLOR J CIVIN: BEDFORDVIEW

I'm interested to ask Mr Rothman a short question. He started off talking about this debt standstill. Now in terms of this debt standstill we are repaying capital overseas. Now, Mr Rothman, in his talk described extensive schemes for electrification of the urban and rural areas. This is going to require considerable capital. He mentioned co-operation from local authorities, business etc. Well I don't know how much local authorities can contribute towards this. I'm just interested to hear Mr Rothman's views as how Eskom visualises capitalising this massive expansion. Thank You.

#### MNR W BARNARD: ELEKTRISITEITSBEHEERAAD

Mnr President ek sal baie kort wees. Ek wil net vir Mr Rothman vra waar ons nou in die toekoms nie meer sy grootste verbruiker gaan wees nie maar wel die Streeksdiensere, hoe gaan dit die toekoms van hierdie Vereniging asook verteenwoordiging op die Raad van Eskom beïnvloed. Gaan ons nog toegang hê daartoe of moet ons nou deur die Streeksdiensere werk en sal hulle dan verteenwoordiging op die Raad hê?

#### MNR AL ROTHMAN: ESKOM

Mnr President ek gaan nie persoonlik op al die vrae antwoord. U weet, mnr Botes het vir my gister 'n baie goeie voorbeeld gegee hoe deleger 'n mens die goed. Nou ek het mnr Forbes, ons Hoofbestuurder, Distribusie en Bemarking, hier en ek sal hom vra om 'n bietjie in detail oor die bemarkingsaangeleenthede wat die mense bekommer sowel as die Streeksdiensere aangeleenthede wat ek dink nie net vir u maar vir ons ook 'n bietjie bekommer om vir ons iets daaroor te sê. Hier's net 'n paar vinnige vrae wat ek kan antwoord en dit is die kwessie van die skokke. Ek dink ek het dit in my voordrag baie duidelik gestel dat Eskom ons verbind het om in die vorentoe die prysverhogings aan te pas op 'n wyse wat dit onder die inflasiekoers sal hou. Ek het gesê dat die aangeduide syfer van 10% vir volgende jaar ons waarskynlik gaan haal en die prysverhoging sal voor die einde van die jaar, aangekondig word. Ek wil beklemtoon dat ons vir ons verbind is om in die toekoms die aanpassings onder die inflasiekoers te hou. Die kwessie of ons nog vir onself sien as 'n grootmaatvoorsiener, dit is nog ons verklaarde beleid daar het niks daaromtrent verander nie. Die hele kwessie van plattelandse elektrifisering en stedelike elektrifisering is dat ons die rol van 'n katalisatiese spel en dat ons nie wil bemoei met die regte en terreine van ander owerhede nie. Ek dink dit staan nog duidelik soos dit bevind is met die Kommissie van Ondersoek en ook soos dit baie duidelik in ons missie en ons strategie in ons verklaarde filosofie beklemtoon word. Wat betref die vraag oor die kapitalisering kan ek meld dat ons die groot



bedrag van R2 000 miljoen waarvan ongeveer die helfte kapitaalbesteding is nie uit ons kapitaalprogram uitgehaal en weggegooi is nie maar dit vertraag is omdat die grootste gedeelte van die kapitaalbesteding vir leweransiers van kragstasie ontwikkelingsprogram is en waarvoor ons baie gunstige uitstel krediet van oorsake gekry het. As 'n mens kyk na die ongeveer R3 000 miljoen per jaar van ons huidige program van elektrisifisering dan is die elektrisifisering van die platteland in die omgewing van omtrent 12% van die totaal. In normale terme gesien is dit 'n groot bedrag maar dit is nie so 'n groot persentasie van ons totale kapitaalbestedingsprogram nie. Ek dink ek het die vrae gehanteer en vra nou vir mnr Forbes, ons Hoofbestuurder, Distribusie en Bemaking, om vir u meer inligting te gee oor die kwessie van die Streeksdiensterade. Hy het heelwat bespreking in die verband gehad. Hy sal ook iets oor die bemerkingsbeleid sê en die kommer wat ek hier bespeur deurdat van u kan dink dat Eskom besig is om op u terrein te oortree.

#### MR R FORBES: ESKOM

Mr President I think Mr Rothman answered Dr Botha's main question adequately, Eskom's policy still being primarily that of a bulk supplier. However, in terms of our rural reticulation I think that everyone is aware that outside of local authority or municipal permit areas where there is no other supplier at present Eskom does do reticulation work and as was indicated we are still connecting of the order of some 10 000 or more odd rural customers every year. However policy wise, Eskom's policy still is wherever possible and as supported and endorsed by the Commission of Enquiry that of a bulk supplier. Eskom does see a role however in terms of facilitating where appropriate, and assisting and providing assistance in certain aspects. I think Mr du Toit of Soweto touched on certain aspects of this when he indicated that the AMEU could also perhaps perform a role. I would like to suggest, perhaps in conjunction with Eskom, in this electrification requirement and programme. The sort of facility that Eskom can offer in terms of assistance is where Mr du Toit made the point of shortage of skilled staff. Eskom is prepared to offer training facilities, for example, the facilities that we do have for training linemen and technicians, to offer those facilities to municipalities, local authorities and developing areas for use in training and helping to develop skilled staff and resources together. Mr du Toit also touched on the matter of half price electricity and Mr Mc Crae in his previous address also made mention of this. I don't think he was referring to half price electricity in terms of cents per kilowatt hour but in terms of capital expenditure and Mr Rothman also made mention of this in his address of appropriate technology or if you like appropriate standards. If one looks at the numbers in capital terms of urban reticulation they have varied from some R2 500 per stand installation wise down to recently some R1 000 per stand depending on what technology is used and that is not something that's been devised or invented by Eskom. All we have done is to look at what is being done by certain people overseas and what technology is available, and there are several municipalities who have made use of for example, bundle conductor and other similar technologies which has brought the price in terms of appropriate technology down per stand. Recent contracts that have been awarded we have seen prices,

from information and talking to local authorities of the order of R1 000 - R1 500 per stand. So that's the sort of thing that one is talking about as to where we were to where we are now in terms of reducing price and utilising appropriate technology. Also in terms of, for example, house wiring which is also not our field but again as a catalyst we pass on information as a common factor or a common supplier to many users. We have noticed that there is scope for appropriate wiring methodologies to be developed.

The question with regard to bulk supplies within municipal areas and associated with that, Eskom's role with regard to Regional Services Councils, firstly as far as bulk supplies within municipalities is conceived our policy is that we will provide the bulk supply to a local authority, and that includes a non-developed or a developing local authority. We would see our role as providing the bulk supply and, wherever possible, that consultants, contractors and private enterprise and adjacent local authorities could assist, whichever was the most optimum solution for that particular environment to do the actual reticulation, to do the planning etc. and that Eskom would come in as a catalyst and if necessary as a supplier as a last resort, to assist with improving the quality of life. With regard to our role, vis-a-vis, Regional Services Councils we are also very much on a learning path, as I think many of us are. However, in the discussions that we have had with certain of the Regional Services Councils that have already been established, and those include the Witwatersrand Regional Services Council and the Pretoria Regional Services Council, we have found, in terms of attitude and in terms of applying appropriate thinking in the interest of the end customer, a very responsible attitude and we've had very fruitful discussions with these RSC's. In fact the role of Eskom as a bulk supplier in those particular cases has been endorsed in that technically it was agreed that Eskom would still supply in bulk to an individual local authority that we would liaise with and keep the Regional Services Council informed in that regard. We're dealing with the local authority, for example, in that particular instance as a customer dealing directly on technical and certain other matters. However, we do have to pay the usual levies over to the RSC and that is being implemented. So, my answer with regard to our role, vis-a-vis RSC's, is that we are on a learning path. It will no doubt depend on the approach taken by each individual RSC but generally, the order in the electrical industry will be maintained and more important of all to the benefit of the end user and the customer. We have seen that a responsible attitude has been taken and we think that the right sort of solution is being negotiated.

With regard to the question on where the capital is coming for the rural and urban areas reticulation. In the case of the rural areas reticulation that we have been busy with as part of our programme for a number of years, that has come from Eskom funding and will continue. In the case of the urban development we would see that wherever possible capital coming from the usual current loan sources, from grants, from the National Housing Commission, from the Development Bank and not necessarily from Eskom borrowings. Only by exception again would one look at that aspect, but that's open to negotiation depending on the particular circumstance. Thank You.

# REPORTS – VERSLAE

# REPORT OF THE SECRETARY FOR THE YEARS 1985 and 1986

# VERSLAG VAN DIE SEKRETARIS VIR DIE JARE 1985 EN 1986

By/Deur Bennie van der Walt



Bennie van der Walt  
Sekretaris van die V.M.E.O.

On behalf of the Executive Council of the Association of Municipal Electricity Undertakings of South Africa, I take pleasure in submitting the following condensed report of the activities of the AMEU for the financial years of 1985 and 1986.

## EXECUTIVE COUNCIL

MR. J A LOUBSER - President

Together with their Councillor Members who are nominated by their respective Councils, the following Engineer Members were elected to the Executive Council at the 49th Convention held in Benoni in 1985:

Messrs/Mnre: A H L Fortmann  
Dr. N S Botha  
M P P Clarke  
E G Davies  
J D Dawson  
J E Heydenrych  
K J Murphy  
D C Palsler  
A J van den Berg

Pursuant to the Constitution the following past Presidents together with their Councillors are also members of the Executive Council:

Messrs/Mnre: W Barnard  
D H Fraser  
P J Botes  
E de C Pretorius  
K G Robson  
J K von Ahlften

During the period under review Messrs Barnard and Palsler resigned from the Executive Council on leaving the municipal service. In Mr. Palsler's place was elected Mr. C E Adams of Port Elizabeth. Mr. Barnard being a past President, did not create a vacancy to be filled. Mr. E de C Pretorius who served on the Executive Council for approximately 19 years and is also a past President is retiring from municipal service on 31st July 1987.

The Executive Council held four meetings, and the Standing Committee four meetings.

## 1. UITVOERENDE RAAD

MNR. J A LOUBSER - President

- (a) Tesame met hul raadslede wat deur die betrokke Elektrisiteitsondernemings genomineer word, is die volgende Ingenieurslede tydens die 49ste Konvensie gehou in Benoni in 1985 gekies tot die Uitvoerende Raad:

- Boksburg President Elect/Aangewese President  
- Bloemfontein  
- Randburg  
- Pietermaritzburg  
- Uitenhage  
- Middelburg TVL  
- Somerset West/Wes  
- Cape Town/Kaapstad  
- Krugersdorp

- (b) Ingevolge die Grondwet is die volgende voormalige presidente met hul raadslede ook lede van die Uitvoerende Raad:

- Johannesburg  
- Durban  
- Roodepoort  
- Potchefstroom  
- East London/Oos-Londen  
- Springs

Gedurende die periode onder oënskou het mnre. Barnard en Palsler bedank van die Uitvoerende Raad aangesien hul die munisipale diens verlaat het. In die plek van mnre. Palsler is mnre. C E Adams van Port Elizabeth verkies. Mnr. Barnard, wat 'n voormalige President is, het geen vakante pos gelaat wat moes gevul word nie. Mnr E de C Pretorius wat op die Uitvoerende Raad vir ongeveer 19 jaar gedien het en ook 'n voormalige President was, tree uit die munisipale diens op 31 Julie 1987.

Die Uitvoerende Raad het vier keer vergader en die Dagbestuur vier keer.

## BRANCHES 2. TAKKE

The five Branches have held regular meetings to discuss matters of mutual interest. Their office bearers for 1986 were as follows:

Die vyf Takke het gereeld vergader om sake van gemeenskaplike belang te bespreek. Hul apmsdraers vir 1986 was soos volg:

### HIGHVELD BRANCH 2.1 HOËVELDTAK

Chairman/Voorsitter - G A Venter, Meyerton  
Secretary/Sekretaris - J J Boshoff, Vanderbijlpark

### GOOD HOPE BRANCH 2.2 GOEIE HOOPTAK

Chairman/Voorsitter - T Pollock, Gordons Bay  
Secretary/Sekretaris - A C T Frantz, Pinelands

### NATAL BRANCH 2.3 NATALTAK

Chairman/Voorsitter - H von Wiechardt, Dundee  
Secretary/Sekretaris - E G Davies, Pietermaritzburg

### EASTERN CAPE BRANCH 2.4 OOS-KAAPTAK

Chairman/Voorsitter - J T F Nel, Kingwilliamstown  
Secretary/Sekretaris - I L Hobbs, Uitenhage

### FREE STATE/NORTHERN CAPE BRANCH 2.5 VRYSTAAT/NOORD-KAAPTAK

Chairman/Voorsitter - D Cloete, Virginia  
Secretary/Sekretaris - R F Davidson, Bloemfontein

## COMMITTEES AND REPRESENTATIVES 3. KOMITEES EN VERTEENWOORDIGERS

The following subcommittees and representatives were appointed by the Executive Council.

Die volgende onderkomitees en verteenwoordigers was benoem deur die Uitvoerende Raad.

### STANDING COMMITTEE 3.1 DAGBESTUUR

J A Loubser plus councillor/raadslid  
A H L Fortmann plus councillor/raadslid  
M P P Clarke  
Dr. N S Botha

### PAPERS COMMITTEE 3.2 REFERATEKOMITEE

J A Loubser, Convenor/Saamroeper  
A H L Fortmann

### FINANCE COMMITTEE 3.3 FINANSKOMITEE

J K von Ahlften, Convenor/Saamroeper  
plus Councillor/Raadslid  
J A Loubser

### RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES 3.4 AANBEVELINGSKOMITEE VIR NUWE ELEKTRIESE VERBRUIKSWARE

M P P Clarke, Convenor/Saamroeper  
A J van den Berg

### ELECTRICITY SUPPLY COMMITTEE 3.5 ELEKTRISITEITSVOORSIENINGSKOMITEE

P J Botes, Convenor/Saamroeper  
Dr. N S Botha  
M P P Clarke  
E G Davies  
D H Fraser  
K J Murphy  
K G Robson

### SABS CO-ORDINATING COMMITTEE 3.6 KOÛRDINERENDE KOMITEE: SABS

A J van den Berg, Convenor/Saamroeper  
J K von Ahlften

**TECHNICAL TRAINING COMMITTEE 3.7 KOMITEE: TEGNIESE OPLEIDING**

J D Dawson, Convenor/Saamroeper  
Dr. N S Botha  
E G Davies  
A H L Fortmann  
J E Heydenrych  
K J Murphy

**SATEPSA MAIN POWER SUBCOMMITTEE 3.8 SATEKG HOOG-KRAGONDERKOMITEE**

P J Botes, Convenor/Saamroeper  
C E Adams  
A J van den Berg

**PUBLICITY 3.9 PUBLISITEIT**

M P P Clarke, Convenor/Saamroeper  
E G Davies  
K J Murphy

**HIGH VOLTAGE CO-ORDINATING COMMITTEE 3.10 KOÖRDINERENDE HOOGSPANNINGSKOMITEE**

Representative/Verteenwoordiger  
R. Leigh

**WORLD ENERGY CONFERENCE 3.11 WÊRELDKRAGBRONKONFERENSIE**

Representatives/Verteenwoordigers  
M P P Clarke  
C E Adams

**ELECTROLYTIC CORROSION COMMITTEES 3.12 KOMITEES: ELEKTROLITILITIESE KORROSIE**

**MAIN COMMITTEE 3.12.1 HOOFKOMITEE**

Representatives/Verteenwoordigers  
A J van den Berg  
A H L Fortmann

**WITWATERSRAND REGION 3.12.2 WITWATERSRANDSE STREEK**

Representatives/Verteenwoordigers  
A J van den Berg  
A H L Fortmann

**NATAL REGION 3.12.3 NATALSTREEK**

Representatives/Verteenwoordigers  
E G Davies  
D H Fraser

**NORTHERN CAPE REGION 3.12.4 NOORD-KAAPLANDSE STREEK**

Representative/Verteenwoordiger  
Dr. N S Botha

**WESTERN CAPE REGION 3.12.5 WES-KAAPLANDSE STREEK**

Representative/Verteenwoordiger  
K J Murphy

**EASTERN CAPE REGION 3.12.6 OOS-KAAPLANDSE STREEK**

Representatives/Verteenwoordigers  
J D Dawson  
R G Robson

**ECA/AMEU/ESCOM LIASON COMMITTEE 3.13 EKV/VMEQ/EVKOMSKAKELKOMITEE**

J F von Ahlften, Reporter/Rapporteur  
M P P Clarke  
J E Heydenrych



THE NBRI STEERING COMMITTEE ON SOLAR ENERGY AND ENERGY CONSERVATION IN BUILDINGS AND BUILT ENVIRONMENT

3.14 DIE NBRI LOODSKOMITEE OOR SONERENJIE EN ENERGIEBEWARING IN GEBOUE EN DIE BEBOUDE GEBIEDE

Representative/Verteenwoordiger  
K J Murphy

CSIR/NEERI ADVISORY COMMITTEE 3.15 WNNR/NEEI-ADVIESKOMITEE

Representatives/Verteenwoordigers  
J E Heijdenrych  
R Leigh

SANCI 3.16 SANKV

Representative/Verteenwoordiger  
A H L Fortmann

SANCI/ILESA/AMEU STREET LIGHT ADVISORY COMMITTEE 3.17 SANKV/IVISA/VME0 STRAATLIG ADVIESKOMITEE

Representatives/Verteenwoordigers  
A H L Fortmann  
J K von Ahlften

SA NATIONAL COMMITTEE OF THE IEC 3.18 SA NASIONALE KOMITEE VAN DIE IEK

Representatives/Verteenwoordigers  
J K von Ahlften  
E de C Pretorius

NEERI POWER SUB-COMMITTEE 3.19 NNEI-KRAGONDERKOMITEE

Representative/Verteenwoordiger  
M J Human

COMMITTEE: STATUTORY REGULATIONS 3.20 KOMITEE: STATUTÊRE REGULASIES

Representatives/Verteenwoordigers  
J K von Ahlften  
J E Heijdenrych

NATIONAL BUILDING REGULATIONS AND BUILDING STANDARDS ACT: BOARD 3.21 DIE WET OP NASIONALE BOUREGULASIES EN BOUSTANDAARDE: RAAD

Representative/Verteenwoordiger  
J F von Ahlften

MEMBERSHIP 4. LIDMAATSKAP

The membership of the AMEU as at 31st December 1986 was as follows:

Die ledetal van die VME0 op 31 Desember 1986 was soos volg:

Honorary Members/Erelede .....	36
Past Members/Voormalige Lede .....	37
Engineer Members/Ingenieurslede .....	146
Associate Members/Assosiaatlde .....	39
Local Authorities/Plaaslike Besture .....	190
Affiliates/Geafileerde .....	129
Total Membership/Totale Lidmaatskap .....	<u>577</u>

MEMBER MEETINGS 5. LEDE-BYEENKOMSTE

The 49th Convention was held in Benoni from 30th September to 2nd October 1985 and was attended by 616 delegates and ladies.

5.1 Die 49e Konvensie het plaasgevind in Benoni van 30 September tot 2 Oktober 1985 en is deur 616 afgevaardigdes en dames bygewoon.

The papers and discussions were printed in the 48th Convention Proceedings which was posted to all members and delegates.

Die referate en besprekings is vvat in die gedrukte 48ste Konvensie Verrigtinge wat aan al die lede en afgevaardigdes gepos was.

TECHNICAL MEETING 5.2 TEGNIESE VERGADERING

The 11th Technical Meeting was held in Port Elizabeth from the 1st to 2nd September 1986, the Proceedings having been also printed.

5.2 Die 11e Tegniese Vergadering het plaasgevind in Port Elizabeth van 1 tot 2 September 1986, die Verrigtinge wat ook gedruk was.

I wish to extend a sincere thanks and appreciation to all Affiliates who have sponsored advertisements for the Proceedings as well as for various social functions.

#### EDUCATIONAL INSTITUTES

The AMEU paid out a total amount of R20 750.00 over the two financial years, for the advancement of education as follows:

University Scholarship/Universiteitsbeurse .....	R 9 000.00
Municipal Training Centres/Munisipale Opleidingsentrums .....	R 5 750.00
Technikons/Technikons .....	R 4 000.00
Technical Colleges/Tegniese Kolleges .....	R 2 000.00
	<u>R20 750.00</u>

#### CONFERENCES

Mr. M P P Clarke attended the 13th Congress: World Energy Conference from 5 to 11th October 1986 in Cannes, France. (See his report.)

Messrs J A Loubser and E de C Pretorius attended the 50th General Meeting of the International Electricity Commission (IEC) from 1 to 9th October 1986 in West Berlin. (See report by Mr. Pretorius.)

We acknowledge with much appreciation the fact that the AMEU was regularly invited by other Municipal Institutes to attend their congresses. Reciprocity exist between the AMEU and other Institutes

#### SUMMARY

This report should be read in conjunction with the reports of the various committees and/or representatives 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 all the members, we express our gratitude for the selfless service.

The Executive Council at all times endeavoured to serve the interests of its members to the best of its ability.

We would like to extend our thanks to all organisations with whom the AMEU maintains close contact for their goodwill and collaboration.

#### BENNIE VAN DER WALT

Aangesien my verslag alreeds twee maande in die besit van die afgewarigdes is, gaan ek dit nie weer lees nie en aanvaar ek dat dit as gelese beskou kan word. Maar u moet my tog toelaat om so 'n bietjie uit te wei oor die afgelope twee jaar termyn se werksaamhede – en dan wil ek sê dat dit besonder vinnig verby gegaan het.

Met twee jong manne soos Jan Loubser en Alwin Fortmann, kan dit nie anders nie, as vinnig. Ek werk eintlik vir twee Presidente. Die een is die amptelike President, die ander een die aangewese President en nog voor ek my voete kan vind, moet 'n mens alreeds begin met die reëlings van die volgende Konvensie. Julie weet self dat die aangewese President die man is wat daarmee besig is. Ek wil egter baie dankie sê vir 'n baie, baie aangename termyn wat ek saam met Jan Loubser as President kon ervaar het. Dit was werklikwaar vriendelik van hom om my so by te staan – en daardie tyd het baie vinnig verby gegaan.

Wat betref die huidige President – baie, baie hartlik geluk ook met u verkiesing. Ons het nou al so lank saam gewerk met die reëlings van hierdie Konvensie dat ek in staat was om u kwaliteite waar te kon neem. Maar natuurlik, 'n man wat rugby skeidsregter was en dertig manne moet hanteer op 'n veld behoort goed te kan organiseer en ek moet sê, Alwin is 'n uitstekende organiseerder.

Dan ook hartlik geluk aan Nico Botha, wat self 'n baie goeie or-

5.3 Ek wil graag 'n besondere woord van dank en waardering betuig teenoor die Geaffilieerdes wat die advertensies van die Verrigtinge geborg het asook vir verskeie sosiale funksies.

#### 6. OPVOEDKUNDIGE INRIGTINGS

Die VME0 het oor die twee finansiële jare 'n totale bedrag van R20 750.00 betaal aan die bevordering van onderwys soos volg:

#### 7. KONFERENSIES

7.1 Mnr. M P P Clarke het die 13e Kongres: Wêreld Energie Konferensie van 5 tot 11 Oktober 1986 in Cannes, Frankryk bygewoon. (Sien sy verslag.)

7.2 Mnr. J A Loubser en E de C Pretorius het die 50e Algemene Vergadering van die Internasionale Elektrotegniese Kommissie (IEK) bygewoon van 1 tot 9 Oktober 1986 in Wes Berlyn. (Sien verslag van Mnr. Pretorius.)

7.3 Dit word met groot waardering gekonstateer dat ander Munisipale Institute die VME0 uitnooi om teenwoordig te wees by hul kongresse. Daar bestaan dan ook 'n wederkerigheid tussen die VME0 en die ander Institute.

#### 10. SAMEVATTING

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 VME0 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 sy lede na die beste van sy vermoë te dien.

Graag bedank ons alle instansies met wie die VME0 'n noue verbintenis het vir hulle goeie verstandhouding en samewerking.

ganiseerder is. Ons het die ervaring van die Tegniese Vergadering in 1984 in Bloemfontein gehad en dit was puik gewees en ons sien weer uit na u puik reëlings in die toekoms.

Mr President, I must also refer to the Executive Council members who are leaving us, with whom I have had the privilege of working together, and then I must refer to Mr Wessel Barnard – now you see him, then you don't see him, he is all over the show. I do not see him now. For Wessel Barnard, Eugene Pretorius, Ken Robson and now also John Dawson, who is leaving the Executive Council, and Dennis Palser with whom I have had very close contact while he served on the Executive Council, thank you all for your kindness and understanding in assisting and guiding me in my duties.

Eugene was eintlik ons 'taalkundige' gewees en hy het na al die 'dortjies op die t's en die strepies deur die t's' gekyk. Hy het die woordspelling onder die vergrootglas bekyk. Eugene, baie dankie ook vir jou bereidwillige hulp. Ek vertrou u almal gaan 'n baie aangename aftreedy tegemoet.

Mr President, I must say that during the past two years there was a great growth in the membership of the AMEU, especially under the Engineers, the Undertakings and the Affiliates. That is why we find this Convention, here in Cape Town, actually a record, with 730 delegates with their good ladies.

Now, of course, the AMEU is not going to stagnate. So I foresee a great future and an even greater growth, and I think I

can predict an attendance in the vicinity of 800 and more delegates at future Conventions.

Dit is vir my baie aangenaam om vir die VMEO te dien en te werk met manne van die kaliber wat in die Uitvoerende Raad is. Hulle is mense met begrip. Hulle is mense met visie en hulle is mense wat die VMEO se doelstellings eerste stel en hulle eie op die agtergrond. Baie dankie vir 'n baie aangename termyn wat ek onder almal kon saamwerk.

## REPORT OF THE FINANCE COMMITTEE: 1985/86



Jules von Ahlfen

The balance sheet at 31st December 1986 shows accumulated funds of R255 040 and committed funds of R140 000.

The committed funds are invested as follows - R30 000 for University Scholarships, R30 000 for awards to Technical Colleges, Apprentice Training Centres and Technicians and R80 000 to offset the expenses for Working groups involving travelling and subsistence allowances of your representatives on AMEU, SABS, IEC and other relevant Committees in which the Association has a direct interest. This includes attendance by the President and a member of the SABS Co-ordinating Committee once in his two year term of office at the international meetings of the IEC which in the period under review was held in Berlin.

The Associations income for the two year period ending 31st December 1986 was made up as follows:-

### MNR JK VON AHLFTEN: SPRINGS

Meneer die President, ek wil net kortliks byvoeg dat daar 'n tikfout in die finansiële verslag voorkom. Die syfer van R255 040 moet R225 040 wees. Ek maak verskoning daarvoor.

Dit is miskien ook net interessant om daarop te let dat die genoteerde beleggings van R99 000 nou op R238 000 te staan kom. Dit verteenwoordig 'n baie gesonde groei en ons moet ons Sekretaris komplimenteer daarmee.

I must also mention the affiliates who have formed themselves into a committee, for their close co-operation and also for the sponsorships and advertisements they so kindly give us when asked. I think the next proceedings will also be proof of that.

Meneer die President, hiermee wil ek volstaan en sê baie, baie dankie vir almal se daadwerklike samewerking om die VMEO te laat groei en bloei.

Subscriptions, Conventions and Technical meeting attendance fees .....	R165 230
Dividends and interest received .....	R109 476
Publications, advertisements and miscellaneous .....	R 39 203

Excess income over expenditure has however declined and strict financial control will have to be exercised in the years ahead to enable the Association to meet its financial commitments and with this in mind the Executive Council has accepted the Finance Committee recommendation that registration fees for Conventions be increased to R150 per delegate and R120 per delegate for Technical meetings which is still well within the limits of similar Associations and with subscriptions remaining unchanged.

The Finance Committee has also supported the proposal of the Affiliates Organisation for differential registration fees to sponsor the affiliates functions at Conventions and Technical meetings. The Executive Council wishes to express its appreciation to the Affiliates Organisation for its continued sponsorship which lends lustre to the social events at Conventions and Technical meetings.

Appreciation must once again be expressed to those Councils who have generously contributed towards the expenses of their engineer members serving on the various Committees without which the burden on the Associations finances would have been much heavier.

In conclusion it is therefore gratifying to once again submit a positive financial report to the Convention for which our thanks are in no small way due to the Secretary, Bennie van der Walt, for his continued efforts as well as for the other members of the Finance Committee for their guidance.

As this is the last report as Convenor of the Finance Committee due to retirement from municipal service towards the end of 1988 I wish to thank all members for their support over the many years I have had the privilege of serving them on this Committee.

J K VON AHLFTEN  
Convenor

Alhoewel die finansiële posisie van die VMEO gesond is, sal ons nogtans ons uitgawes streng moet beheer om al ons verpligtinge op al die komitees en verteenwoordiging op die SABS komitee en andere na te kom.

Then also a special word of appreciation to the Affiliates for having provided differential registration fees for the social functions which is very much appreciated. Let us give them a big hand.

With these few words I propose the adoption of the Financial Report.



Max Clarke

At the time of preparing this report members will have received the first issue of AMEU News, published in March 1987. This followed detailed consideration by the Executive Council during 1986, of all the factors and the many problems involved in providing publicity of AMEU activities.

Present thinking is that this newsletter will be published quarterly (the June issue is now at the printers) and that it will be financed partly from advertising sponsorship and partly from AMEU funds.

The content is designed to convey official information and news to members and interested parties, and the circulation is approximately 1800. This includes all Engineer Members, Affiliates, Associates, and all Town Clerks, Town Secretaries, Town Treasurers, Town Civil Engineers and Chairman of Management Committees of all member undertakings. All copies are individually mailed with a view to ensuring that the person concerned each receive a personal copy.

It's present format is an attempt to strike a balance between the needs of members to receive technical information and general "news", and important and interesting information from official organisations such as the S.A.B.S., as well as AMEU developments. It's style is intended to make as much as possible of the contents interesting to non-technical readers with the specific purpose of creating interest in the wide variety of activities and projects which form the basis of electricity supply undertakings – hopefully creating an awareness of the fact that electricity is more than just "what happens when a switch is pressed".

The success or otherwise of the newsletter – and hence, whether it will be possible to continue its publication – depends mainly upon its economic viability and the response of members by way of participation, feedback and support of the advertisers.

It was launched with the full support of the Affiliates Committee. Their respective companies have come forward with much appreciated positive contributions in all respects. The initial rates that were set for advertising and advertorials will have to be reviewed to reduce the extent of funding from the AMEU and this is receiving attention at present.

The most important questions which must be answered are, "... is this what members require? ... does this meet the publicity needs of the AMEU? ... if not, why not?

Where we go from here is in your hands. I appeal to you all to come forward with your comments and suggestions, ... this is OUR publication.

M P P CLARKE  
Convenor

Met die skrywe van hierdie verslag het lede alreeds die eerste uitgawe van VME0 NUUS, wat in Maart 1987 gepubliseer is, ontvang.

Na ernstige oorweging van al die faktore en probleme wat ondervind was om publisiteit vir die VME0 te bewerkstellig, het die Uitvoerende Raad gedurende 1986 tot die slotsom gekom dat 'n eie publikasie die beste oplossing sal wees.

Vir die huidige word beoog om die nuusbrieff kwartaaliks te publiseer (die Junie uitgawe word tans gedruk) en dat die koste gedeeltelik uit advertensies en VME0 fondse gedek sal word.

Die beoogde inhoud dek amtelike inligting en nuus items vir lede en belanghebbendes en dit word aan ongeveer 1800 lesers versprei. Dit sluit alle Ingenieurslede, Affiliate, Associate, en Stadslerke, Stadssekretarisse, Stadstoeskouers, Siviele, Stadsingenieurs en Voorsitters van Bestuurkomitees van lede ondernemings in. Die afskrifte word individueel gedreëseer om sodoende te verseker dat elkeen persoonlik 'n afskrif ontvang.

Die huidige formaat probeer om 'n balans tussen lede se behoeftes vir tegniese inligting en "nuus", asook belangrike en interessante inligting van amptelike organisasies soos SABS en VME0 verwickelinge, te handhaaf.

Die skryfstyl en uitleg word doelgerig gebruik om so vër as moontlik die belangstelling onder nie-tegniese lesers in die basiese projekte en aktiwiteite van elektrisiteitsondernemings aan te kweek. Sodoende word beoog om meer bewustheid oor elektrisiteits aangeleenthede te bewerkstellig.

Die sukses van die nuusbrieff, met ander woorde sover dit moontlik gaan wees om voort te gaan met verdere publikasies, hang hoofsaaklik af van die ekonomiese lewensvatbaarheid van die nuusbrieff saam met die respons van ons lesers wat betref deelname, terugvoering en ondersteuning vir die adverteerders.

Die Affiliaat se Komitee het sy volle ondersteuning aan dié projek gegee en die positiewe bydraes wat deur die respektiewe maatskappye gemaak is, word met groot waardering en dank erken.

Die oorspronklike tariewe vir advertensies sal nitemin hersien moet word, om te verseker dat die VME0 bydraes tot 'n minimum beperk word. Dié saak word tans ondersoek.

Die belangrikste vrae waarvoor daar antwoorde gekry moet word is, "... is dit wat lede wil he? ... bevredig dit die VME0 se publisiteits behoeftes? ... indien nie, hoekom nie?

Waarheen ons hiervandaan gaan berus nou in u hande. Ek doen 'n beroep op u almal om u kommentaar en wenke voor te lê ... dit is ONS publikasie.

M P P CLARKE  
Saamroepel

## MR MAX CLARKE: RANDBURG

Mr President, my published report was written some months ago in order to meet circulation deadlines for this Convention and since then all members will have received or should have received the June issue of AMEU NEWS, and many will have also received the September issue. I understand that they did arrive in many offices by Thursday and Friday of this past week. On that score I have a limited number available - I have put some out on the tables this morning and for those of you who would like extra copies, please contact me and I can make arrangements. The interesting session is that since the first issue we have enlarged the circulation by including the librarians of every member Town Council. The idea being that we would like these AMEU Newsletters to lie around in libraries and be read by members of the general public. As you have realised, publicity is one of those things that is seen by all and we are hoping that this will assist the image of the AMEU and the industry in general. The South African Universities, who have Engineering Faculties, will also be receiving copies in due course. I have not yet finalised the details but that will be done in the very near future. To date, all criticism has generally been positive and the comments have been complimentary on the publication but I repeat, as I said in my published report, is this what members

want? And does it meet the needs or publicity of the AMEU? If you don't think it does then will you please make contact with me or any member of the Executive and let us have constructive criticism.

Dit is baie, baie belangrik, uiters belangrik, mnr die President, dames en here.

Your support in the form of items of interest from both our undertakings and our commercial colleagues are essential for this publication to continue and to grow. The response to the advertisers and/or the sponsors by our member undertaking is essential and of course sponsorship by our affiliates is equally important. The newsletter is not financially self-supporting, it is heavily subsidised by AMEU General Funds but the extent of that subsidy depends on the extent of support from the companies who are sponsoring. Anybody who would like a specific detail can contact me at a later stage.

The Executive Council must consider the future of the newsletter on Thursday and if you would like to discuss aspects of this either with me or any member of the Executive Council. I'm sure they would appreciate your comments and any constructive criticism that you can offer. I'm sure they would appreciate this very much indeed.

## VERSLAG VAN DIE AANBEVELINGSKOMITEE VIR NUWE ELEKTRIESEWARE

Die Komitee fungeer in terme van die vereistes onder die Gebruikskode vir die bedrading van persele en maak aan die Hoof Inspekteur van Masjinerie aanbevelings oor toerusting wat bedoel is om gebruik te word in die bedrading van persele, en waarvoor 'n SABS spesifikasie nog nie bestaan nie.

Die volgende organisasies is op die komitee verteenwoordig:-

- VMEQ, wie se verteenwoordigers die Voorsitter, Vice-Voorsitter en Sekretaris uitmaak,
- Departement van Mannekrag,
- S A Buro vir Standaarde,
- Departement van Pos- en Telekommunikasiewese,
- S A Instituut van Elektrotegniese Ingenieurs,
- Eskom,
- Elektrotegniese Aannemersvereniging van S A,
- Vereniging van Elektrotegniese Ingenieurswese en Verwante Industrieë,
- S A Vereniging van Raadgewende Ingenieurs,
- Johannesburg Elektrisiteitsdepartement.

Gedurende die afgelope twee jaar het die Komitee agt kere vergader en is 32 aansoek vir goedkeuring van elektriese toerusting oorweeg. Die uitslae is soos volg:-

Aanbevel vir magtiging	: 23 aansoek
Verwys na SABS vir toets	: 4 aansoek
Spesifikasies beskikbaar of voorheen gemagtig	: 2 aansoek
Nie aanbevel vir magtiging a.g.v. onvoldoende inligting	: 1 aansoek
Geen fasiliteit a.g.v. geen respons van applikant nie	: 1 aansoek
Deur die Hoof Inspekteur ingetrek	: 1 aansoek

Toetsverslae en aanbevelings van die SABS is 'n voorvereiste wanneer aansoek deur die komitee oorweeg word en die Buro se insette in dié verband word met groot waardering erken.

Gedurende die oorsig periode het Mnr Bruce Cumming, 'n ingenieur werksaam by Johannesburg Stadsraad en 'n verteenwoordiger van die S.A.I.E.E. op die komitee, met pensioen uit die diens getree asook Mnr Theo Roskam, Departement Mannekrag en K Nero, Eskom. Die dank en waardering vir hulle aktiewe bydraes tot die werksaamhede van die komitee oor die afgelope aantal jare word erken.

## REPORT OF THE RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES

This Committee operates in terms of the provisions of the code of Practice for the Wiring of Premises and makes recommendations to the Chief Inspector of Machinery on equipment which is intended for use in fixed wiring installations when such equipment is not covered by an appropriate SABS specification.

It is made up of representatives of the following organisations:-

- AMEU, whose representatives provide the Chairman, Vice Chairman and Secretary,
- Department of Manpower,
- South African Bureau of Standards,
- Department Post and Telecommunications,
- South African Institute of Electrical Engineers,
- Eskom,
- Electrical Contractors Association of South Africa,
- Electrical Engineering and Allied Industries Association,
- S A Association of Consulting Engineers,
- Johannesburg Electricity Department

During the past two year period it has met eight times and has considered a total of 32 applications for approval of electrical equipment, with the following results:-

Recommended for authorisation	: 23 applications
Referred to SABS for testing	: 4 applications
Covered by Specification or previously authorised	: 2 applications
Rejected because of insufficient information	: 1 application
No finality due to lack of response from applicant	: 1 application
Withdrawn by Chief Inspector	: 1 application

Test reports and recommendations from SABS are essential requirements when applications are considered by the Committee, and the Bureau's work in this regard is greatly appreciated. During the period under review Mr Bruce Cumming, an engineer with Johannesburg City Council, and representing the S.A.I.E.E. on the Committee, retired from service as also did Mr Theo Roskam, Department of Manpower and Mr K Nero, Eskom. Grateful appreciation is recorded for the many years of active contribution which these members have made to the committee's work.



Die komitee is tans besig met 'n ondersoek in verband met die verouderde magtigings sertifikate wat vir langer as die 3 jaar vasgestelde periode bestaan en wat nog deur sekere organisasies as 'n bemerkingsdokument gebruik word.

M P P Clarke  
Verteenwoordiger

The committee is at present looking into the problem of certificates of authorisation which have been in existence for the 3 year period provided in the Code, but which are still being used by organisations marketing the respective products.

M P P Clarke  
Representative

## ELECTRICITY SUPPLY SUB-COMMITTEE: REPORT

1. Mr Palser was the convener of the sub-committee, but subsequent to his decision during 1986 to retire on pension the Executive Council appointed me in this position. Mr M P P Clarke acted as secretary and the committee is greatly indebted to him for his excellent work and arrangements.

Three meetings were held during the two years. Two respectively at Randburg on 4 February 1986 and at Cape Town on 5 August 1986 under the guidance of Mr Palser and one at Kempton Park on 4 February 1987.

2. The following aspects have been dealt with by the committee and each will be addressed separately in this report.

- (a) SATEPSA
- (b) Reserve transformer list
- (c) Safety posters
- (d) Low tension overhead lines
- (e) Amending Act on Electricity
- (f) ESCOM tariff increases
- (g) Power marketing strategy
- (h) Credit card meters
- (i) Electricity supply to Cogmanskloof

### 3. REPORT

#### (a) SATEPSA

On 4 February 1986 this committee was addressed by Mr Conradie, Chairman of SATEPSA (Power) and Mr Marloth and certain misunderstandings were resolved. During 1986 the third Primary Preferential Consumers list was compiled and approved. All consumers on the list were informed of their allocations. The fourth list will be compiled during 1988. Each of the 12 regions will draw up its own emergency power plan before the end of 1987. Municipalities have been requested to participate in the SATEPSA (Power) exercises or to alternatively conduct their own exercises.

Directives for the allocation of limited amounts of electrical power that may be available for distribution after the primary Preferential Consumers have been supplied, were drawn up and approved by the AMEU, with the stipulation and allocations will be in accordance with the requirements of the emergency. These directives still have to be approved by the Head Committee.

#### (b) The Reserve Transformer List

This list has last been updated in 1985 and members are requested to inform me of any additional transformers larger than 5MVA that were installed since 1985.

#### (c) Safety posters

Safety posters, videos and pamphlets regarding the safe use of electricity were compiled by ESCOM. Copies were made available during the AMEU Technical Meeting in Port Elizabeth. ESCOM may be approached directly for obtaining these posters. They can be obtained with the emblem of the undertaking instead of that of ESCOM.

#### (d) Low tension overhead lines

Directives for the erection and maintenance of low tension overhead lines have been approved by the AMEU and ESCOM, but the Department of Manpower has adopted a concept directive different to the one approved. The matter was brought under the attention of the Director of Manpower and he has undertaken to give his interpretation during the convention rather than at the different branches in order to avoid diverging opinions.

#### (e) Concept Electricity Bill and ESCOM Bill

The bills were submitted to all the members of the Electricity Supply Committee and no further comments were received. The bills presently serve before Parliament and will hopefully have been passed before the Convention. The most recent amendments to the concept legislature that were drawn up in consultation with the Pretoria City Council have to do with the supply areas of Regional Services Councils to correspond with the supply areas of the municipalities in their region. Where a municipality has the right to supply, the Regional Services Council concerned will have the same right, but this supply right may not exceed the boundaries of such area.

#### (f) ESCOM tariff increases

During 1985 the Executive Council of the AMEU has expressed its concern regarding the tariff increases by ESCOM. As a result of the representation ESCOM and I visited all AMEU branches, where ESCOM presented its case. In future increases will be limited to one annual increase with effect from January each year. Efforts will be made to keep increases below the rate of inflation and in 1987 the increase was 12%. It is envisaged that the immediate future increases will be in the order of 10%. At least three months prior notice will be given.

#### (g) Power Marketing Strategy

Mr Fortmann, as our President Elect, and I myself were invited to attend a Marketing Conference held for the benefit of ESCOM's senior management on 9 June 1987, at the Auditorium Administration Block, ESCOM College, Halfway House. The meeting was addressed by senior ESCOM officials as well as three visitors from the UK, Messrs Brian Booth, John Williams and Ken Wingfield and by research organisations in SA.

The Power Marketing mission is to promote the cost-effective use of electricity in Southern Africa to satisfy consumer needs. The objectives are: (1) the efficient utilisation of energy; (2) reduction of capital demand on economy; (3) optimum utilisation; (4) keeping the growth in electricity price below inflation rate. These objectives are to be achieved through the close involvement of customers.

Research will be conducted on customers' needs, attitudes and perceptions. ESCOM will develop a professional marketing organisation for ESCOM. The aim is also to develop tariffs and conditions of supply which will satisfy ESCOM's revenue requirements and meet the customers' need for greater control over their electricity cost and make available a wide range of information through customer advisory services and information centres. Liaise pro-actively with municipal and other customer groups to promote and support the overall marketing strategy.

The three visitors from overseas gave most interesting talks on what actually transpired in the UK since the formation of Power Marketing Strategies by utilities and the establishment of Marketing Management Consultants.

A report was also received from a market survey done on the black market, where advice on the correct, safe and economic use of household appliances is urgently required. Problems with the repairs of heaters, stoves, kettles and irons are frustrating as well as expensive to the black community. They complain that during their peak period of 18h00 to 21h00 blackouts occur and reset switches are located in the street under lock and key. Meter readings are inaccurate and complaints to local authorities result in a frustrating experience, so much so that they feel an expert like ESCOM should take over the supply. The budget meter concept was received with mixed feelings and it should be optional.

From the foregoing it is therefore clear that local authorities, as supply undertakings, will also be closely involved in the Power Marketing Mission and the Electricity Supply Subcommittee will pursue this matter further and will give timeous reports to the Executive Council.

(h) **Credit card meters**

The Minister of Economic Affairs and Technology has appointed a Committee to investigate the local production and use of credit card meters. ESCOM was charged with the technical tests of available meters. Certain manufacturers have already demonstrated their units but apparently there is only one type on the market that has been tested by ESCOM. The AMEU by means of the Electricity Supply Committee will co-operate with ESCOM and you will immediately be informed of any new developments in this matter.

(i) **Cogmanskloof**

The Cogmanskloof Irrigation Council has made rep-

resentations to the Minister of Economic Affairs and Technology to provide relief regarding its electricity costs. The Council has nine supply points of which two are provided directly by ESCOM and seven by the municipalities of Ashton, Montagu and Robertson. The municipal tariffs are apparently 40% higher than those of ESCOM.

Several small municipalities have relative large concession areas and farmers in some of these areas have requested the Minister that ESCOM take over their supply. ESCOM was not willing to take over the networks and negotiated with the concerned municipalities to reimburse them for the difference in cost between the energy consumption according to the ESCOM and the municipal tariffs.

The AMEU and other members of the Electricity Council that represent industries expressed their concern over the fact that a certain group of consumers, in this case farmers, are being benefited at the cost of other classes of consumers. The principle was laid down that the additional costs arising from this arrangement must be recovered from farmer consumers in ESCOM's own supply area and not from other classes of consumers. This must be done through the adjustment of the tariff concerned. This would only apply to bona fide farmers and the SA Agricultural Union in consultation with the Electricity Control Board and ESCOM must decide which farmers qualify for the arrangement.

A meeting was convened at Potgietersrus between the parties concerned and I would also have been present. However, the SA Agricultural Union has decided to reconsider the matter. With regard to the Cogmanskloof scheme the arrangement has already been implemented and further developments are being awaited.

P J BOTES

Convener

**MNR PJ BOTES: ROODEPOORT**

Mnr die President, dames en here, dit is vir my 'n groot genoë om namens die lede van die Elektrisiteitsvoorsieningskomitee die voorgeskrewe verslag aan u voor te lê vir bespreking. Ons moes noodgedwonge 'n verdere vergadering hou om dringende aanbevelings oor sekere aangeleenthede te bespreek wat ons dan aan die Uitvoerende Raad sal voorlê.

Ek wil net graag die volgende aspekte uit die verslag verder toelig:

(a) **Die Reserwe Transformatorlys**

U weet ek het 'n lys van transformatorreserwes van die VME0 en u moet my asseblief in kennis stel indien u enige toevoegings gemaak het oor die afgelope twee jaar. Tweedens mnr die President, kry ek baie min navrae. Is dit die moeite werd om hierdie lys op datum te hou? Ek sal graag wil weet hoe u voel oor die saak. Ek weet nie of die Uitvoerende Raad hieroor besluit het nie, maar hoe voel almal hieroor? Persoonlik sien ek nie die nodigheid daarvan nie, maar ek is in u hande. Ek het 'n rekenaarsprogram en dis vir my geen probleem nie, so lank u net vir my die gegewens gee.

**PRESIDENT**

Mnr Botes, is dit nie een van daardie items wat jy vir jare en jare miskien nooit nodig kry nie, maar op 'n dag gebeur dit skielik dat 'n transformator foutief raak en dan het jy ene nodig. Dit gebeur sonder enige waarskuwing en dan is daardie lys dalk handig.

**MNR BOTES: ROODEPOORT**

Goed, ek sal dit doen. Dankie.

(b) **Veiligheidsplakkate:** Soos ek gesê het in my verslag: Dit is by ESKOM verkrygbaar, teen koste natuurlik en as u, u

wapen - die Stadswapen, daarop wil hê, kan u dit ook met ESKOM reël en moontlike reëlings tref.

(c) Die beveliging van laagspanning oorhoofse lyne, is 'n groot probleem, maar ek verstaan dat die Hoofinspekteur ons môre sal toesprek oor die aangeleentheid.

(d) Die Elektrisiteitswet en die ESKOM-wet is op 4 September 1987 gepubliseer (Staatskoerante 10893 en 10894).

Ek wil dit onder u aandag bring dat die VME0 by verskeie geleenthede die voorreg gehad het om insette te lewer tydens die opstel van hierdie wetgewings, iets wat in die verlede nie plaasgevind het nie. Ons het gewoonlik 'n wysiging gesien nadat dit gepubliseer was. ESKOM, wat die leiding geneem het met die opstel van die twee wetgewings, moet bedank word vir hierdie samewerking, veral mnr PJT Oosthuizen, Hoofbestuurder (Dienste) onder wie se leiding die opstellings plaasgevind het.

Mnr die President, ek weet nie of daar enige verder kommentaar is nie.

**PRESIDENT**

Kan ons van die vloer af verneem asseblief, is daar kommentaar oor die aspekte wat mnr Botes nou net genoem het?

**MNR HEYDENRYCH: MIDDELBURG (TRANSVAAL)**

Mnr President, net 'n vraag aan mnr Botes in verband met die Elektrisiteitswet en die ESKOM-wet. Dit is wel so dat die twee wette deur die Parlement aanvaar is, maar daar is 'n bepaling dat die wette op 'n bepaalde datum in werking sal tree soos deur die Staatspresident bepaal. Is daardie bepaling al reeds gedoen?

**MNR BOTES: ROODEPOORT**

Sover ek weet is dit nog nie gedoen nie. Dit sal op 'n later stadium wees.

**PRESIDENT:**

Goed mnr Botes, wil u aangaan asseblief?

**MNR BOTES: ROODEPOORT**

**ESKOM-TARIEFFERHOEGINGS**

Soos u weet is belowe dat ESKOM ten minste drie maande kennis sal gee alvorens 'n tariefferverhoging in werking tree. Dit blyk 'n probleem te wees want die finale goedkeuring word deur die Kabinet gedoen en 'n verklaring in die verband word eers aan die einde van Oktober verwag. Intussen kan u aanvaar dat u voorsiening kan maak vir 'n 10% verhoging in die ESKOM-tarieffertarif met ingang 1 Januarie 1988 en dat verhogings onder die inflasie-koers gehandhaaf sal word vir die jare 1989 en 1990. Mnr Rothman, wat namens mnr John Maree u later sal toespreek, sal heel waarskynlik verder uitbrei oor hierdie aangeleentheid. Enige besprekings behoort dus gerieflikheidshalwe tydens sy spreekbeurt gedoen word. Ek weet nie of daar verdere kommentaar is nie.

**MNR J KRIEK: EMPANGEN**

Ek wil net graag vir mnr Botes in verband met die nuwe Elektrisiteitswet vra, Klousule 26 - wat bepaal dat 'n voorsieningsowerheid skuldig is, totdat die teendeel bewys is, nie strydig is met ons Romeins-Hollandse regstelsel nie?

**MNR BOTES: ROODEPOORT**

Ek is nie 'n regsgeleerde nie, maar ek kan u verseker dat hierdie saak baie deeglik deur ESKOM se Uitvoerendekomitee bespreek was. Mnr Oosthuizen, wat 'n advokaat is, het die saak onder hande gehad en almal is tevrede daarmee. So ek kan nie presies daarop antwoord nie, ek is nie 'n regsman nie, ek laat dit aan u oor. Ek voel dat as dit deur daardie kanale gegaan het, waar dit wel deur gegaan het, dan sal dit reg wees.

**PRESIDENT**

Dankie mnr Botes. My sentimente lê natuurlik by wat mnr Kriek sê, maar ek is ook nie 'n regsgeleerde nie, maar dit kom my nie heeltemal reg voor nie.

**MNR BOTES: ROODEPOORT**

Mnr die President, kan ons dan net u kommentaar sowel as die van mnr Kriek kry, dan kan ek weer probeer om daarop in te gaan op 'n latere stadium.

**PRESIDENT:**

Mnr Botes dis nie wat die mense voel nie, maar ek dink wat mnr Kriek daar sê is reg en miskien kan ons mnr Kriek vra om iets hieroor op te stel en in te stuur, sodat dit weer aangevoer kan word. Dit lyk net nie reg nie. Ek wonder of mnr Alewyn Burger miskien daarvan weet of onlangs met so iets te doen gehad het. If you would like to add to it, Mr Burger.

**MNR A P BURGER: ERELID**

Mnr President, ons moet natuurlik nie die probleem verwar deur die toepassing van die Romeins-Hollandse Reg nie. Die sogenaamde "strict liability" nie, want dit was die posisie. 'n Mens moet vir jouself uitmaak wie is verantwoordelik vir enige ongelukke wat plaasvind in die elektrisiteitsonderneming, afgesien van sogenaamde nalatigheid. Nou u weet, daardie standpunt is altyd gehandhaaf in die Elektrisiteitswetgewing alhoewel die howe dit op 'n stadium nie so geïnterpreteer het dat hierdie absolute aanspreeklikheid aan die kant van 'n onderneming is nie. Ek moet vir u sê dat dit egter moeilik sal wees om met daardie beginsel weg te doen en terug te gaan na 'n posisie waar nalatigheid bewys moet word. Dit sal nie so maklik wees, dink ek, om so iets deur die Parlement te kry nie. Ek het ongelukkig nog nie die teks gesien, die presiese teks van die Wetgewing soos dit nou aanvaar is deur die Parlement nie, maar ek dink as u gaan skop teen die beginsels soos dit op die oomblik belaggaam is, of tot onlangs was, of wel trouens soos dit vandag nog is, in die Elektrisiteitswetgewing, - want u weet, die nuwe wetgewing is nog nie eers afgekondig nie, maar as dit bly soos

dit huidige is, sal u hom nie baie maklik verander kry in die nuwe wetgewing nie. Ek dink self Advokaat Oosthuizen sal met al die mag van ESKOM dit nie maklik verander kry nie, maar ek weet nou nie presies hoe hulle dit gestel het nie.

**MNR BOTES: ROODEPOORT**

Ek wil net noem dat die Elektrisiteitswet afgekondig is, maar dit is nog nie in werking gestel nie. Ek dink op hierdie stadium kan ons niks daaraan doen nie, maar die probleem van mnr Kriek kan miskien op ingegaan word en ek kan verslag doen aan hom.

**MNR TIENE LOOTS: ELLISRAS**

Mnr Botes, my vraag aan u is net: as hierdie Wette nou gepubliseer word en u ondersoek dit so, word dit aan die Prokureur-Generaal voorgelê sodat hy bewys is daarvan? By my het ek 'n probleem gehad van 'n oortreder, met 'n ernstige oortreding in die Raad het besluit dat die persoon aangekla moet word. Ons het die saak ondersoek met wat geskryf is. Wat ek gehad het, het ek voor die Fabrieksinspekteur gelê en hy het dit ook goedgekeur en dit is verwee na die Prokureur-Generaal en hy het gesê hy kry nie die Wette nie. Die gevolg is, die saak teen die mnr is teruggetrek en ons sit nou met 'n eis teen ons.

**MNR BOTES: ROODEPOORT**

Mnr die President, ek moet sê, ek is nou regtig nie so magtig nie, maar dit (die Wet) behoort outomaties by daardie mense te wees. Ek weet nie presies wat die probleem daar is nie. Ek veronderstel dit is oor een of ander rede wat dit uitgegooi is. Ek sal nie kan sê nie.

**PRESIDENT**

Goed, wil u nog aangaan mnr Botes.

**MNR BOTES: ROODEPOORT**

Kommer is deur die komitee uitgespreek oor die spesiale vergunnings in die tariewe wat ESKOM aan munisipaliteite toeken wat oor self-opwekkings-vermoëns beskik, waarvolgens vir addisionele energieverbruik net 'n energieverwante toeslag gehef word en nie vir die aanvraag-verwante kostes nie. Groter munisipaliteite wat reeds die voordeel het om as gevolg van self-opwekking laer tariewe aan sy verbruikers te kan lewer as munisipaliteite wat uitsluitlik elektrisiteit van eskom aankoop, trek nog verder voordeel deur hierdie toegewing. Op die oog af lyk dit of die ander verbruikers deur hierdie vergunning gesubsidieer word. Die aangeleentheid word na die Uitvoerende Raad verwys.

Daar is sekere lede van ons komitee wat oor hierdie aangeleentheid besorg is. Sekere lede van die komitee het hulle skerp uitgespreek daaroor.

Oor die "kragbemarkingstrategie" gaan ek nie verder uitwee nie, behalwe om by te voeg dat hierdie strategie meer momentum sal kry in die komende jare.

Kredietkaartmeters geniet die aandag van ESKOM en die Elektrisiteitsvoorsienings-komitee het besluit om 'n versoek tot ESKOM te rig om geen besluite hieroor te neem voordat die VMEQ, as die grootste verbruiker van hierdie meters, deeglik in die saak geken is nie.

Vir u inligting kan genoem word dat tot betreklik onlangs, nog net een meter, genaamd Ampcon 1, getoets was. Wysigings is daarna aangebring en hierdie proto-tipe sal voldoen aan die vereistes mks verdere geringe wysigings aangebring word. Die betrokke vervaardiger is nou besig om twee produksiemodelle te ontwikkel wat vir verdere toetsing na ESKOM verwys sal word. Daar is egter ander vervaardigers wat eers vaste verbintenisse wil aangaan alvorens oorgegaan word tot vervaardiging. Dit bring mee dat verbintenisse aangegaan word oor 'n baie ingewikkelde, tegniese elektroniese produk, wat nog net in pamflette beskryf word. Sulke produkte behoort eers fisies getoets te word en die toetsuitslae van 'n behoorlike onafhanklike toetslaboratorium behoort beskikbaar te wees, voordat sulke verbintenisse aangegaan word.

Mnr die President, verder tot die Cogmanskloof aangeleentheid. Ek dink dis baie deeglik omskryf in my skrywe. 'n Sub-komitee van die SA Landbou Unie het sekere voorstelle geformuleer wat deur die Elektrisiteitsvoorsieningskomitee oorweeg is en waaroor eersdaags aan die Uitvoerende Raad verslag gedoen sal word. 'n Wakende oog word oor hierdie aangeleentheid gehou en u sal volledig ingelig word oor enige gebeurlikhede.

ESKOM requested the AMEU to participate in developing a databank on the products of manufacturers, their technological expertise, local manufacture content and also what users want in the electrical industry.

This project stems from the general concern in government circles and the power industry as a whole for the need to rationalise aspects of local manufacturing for strategic and economic reasons.

The aim of all this is to formulate a national co-ordinated macro plan to implement increased local technology and manufacture. One must also be aware that items purchased from overseas, at below South African prices, are heavily subsidised by that country. We are, therefore, not doing our country any good in indiscriminately buying cheaper items manufactured overseas.

This liaison committee or user group would present a forum for

the discussion and agreement upon strategies and policies for common problems regarding the promotion of local manufacture of power generating and distribution equipment, the development of required technologies and the rationalising of equipment specifications.

It was decided to recommend to the Executive Council that the AMEU should participate and appoint representatives.

Mr President, ladies and gentlemen, Mr Robson of East London, a staunch member of our sub-committee, will retire in the near future, and I want to pay tribute to all his contributions to the workings of this committee. We shall surely miss him.

I also wish to thank Mr Palser who was originally appointed Chairman of this Committee, for his contributions to the workings of this committee and to our friend, Mr Max Clarke, for the secretarial work he so ably provided and to all the members of the committee for their contributions. May I also add the names of Mr Venter of Cape Town and Mr Schermann of Pretoria and thank them for their contributions at our last meeting.

As 'n oud-President en my betrokkeheid op die Elektrisiteitsraad, is dit miskien wenslik dat iemand anders hierdie taak van my oorneem in die toekoms.

Dankie mnr die President.

## SABS CO-ORDINATING COMMITTEE REPORT

1. Pursuant to a resolution of the Executive Council (permitting rapporteurs to submit their reports in the official language of their choice) the language used in this report will be partly English and partly Afrikaans.

Ingevolge 'n besluit van die Uitvoerende Raad (wat verslaggewers toelaat om hulle verslae in die amptelike taal van hulle keuse aan te bied) is hierdie verslag gedeeltelik in Afrikaans en gedeeltelik in Engels.

2. Tensy anders gestel, dek hierdie verslag die tydperk 1 Mei 1985 tot 30 April 1987. (Vorige verslae het die tydperk van 1 Mei 1985 reeds gedek.)
3. Die lede van die Komitee is mnr J A Loubser, J K van Ahlften, A J van den Berg en E de C Pretorius (sameroeper). Mnr Pretorius was sameroeper tot 31 Desember 1985 en is op 1 Januarie 1986 deur mnr Van den Berg opgevolg. Mnr Pretorius was sedert 1979 sameroeper van hierdie Komitee en het op 19 Maart 1987 as lid van die Komitee uitgegee. Namens die Komitee wil ek dit graag boekstaaf dat mnr Pretorius sy pligte as sameroeper met groot toewyding en nougesetheid uitgevoer het en hy word hartlik bedank vir sy deelname en leiding.

### 4. VERGADERINGS/MEETINGS

- 4.1 Die Komitee het tot 19 Maart 1987 vier vergaderings gehou. Heelwat sake is onderling ook telefonies afgehandel.
- 4.2 Salient points from the deliberations and activities of the Committee are as follows:
  - (a) Representatives of the AMEU have been nominated to serve on the following new SABS technical committees:
    - (i) 713/50580: Komitee vir gemeenskaplike seine vir gebruik in mobiele landradiostelsels met dinamiese frekwensiedeling.

## KOÖRDINERENDE SABS-KOMITEE VERSLAG

- (ii) 733/50150: Safety requirements for electrical appliances (Compulsory Specification).
  - (iii) 763/51270: Safety requirements for electrical distribution boards (Compulsory Specification).
  - (iv) 763/51130: International plug and socket outlet system (Sub-committee.)
  - (v) 772/50530: Compulsory safety specification for earth leakage protection units.
  - (vi) 773/50010: Gebruikskode vir die toets van elektrisiteitsmeters (hersiening van SABS 01-1953 soos gewysig 1971.)
  - (vii) 783/50350: Hoëdrukkwiklampe.
  - (viii) 783/50370: Traffic lights.
  - (ix) 783/50380: Overhead projectors.
  - (x) 791/50180: Voorgestelde standaard vir kragtransformators.
- (b) Die Koördinerende SABS-Komitee is versoek om die moontlikheid te na die daarstelling van 'n spesifikasie vir fotoselle te ondersoek. Hierdie saak geniet nog aandag.
- (c) The following projects have been cancelled:
- (i) D24/1: Street furniture – a design institute project.
  - (ii) 763/51130: International plug and socket outlet system.
  - (iii) 791/50360: Dry type transformers.  
Since these transformers are covered by IEC and there was no apparent need for further standardization for use in South Africa, the project was cancelled.
- (d) AMEU representation has been withdrawn from the Committees dealing with the revision of the specifications for the various flameproof enclosures for electrical apparatus, i.e. non-sparking electrical equipment for use in Class I, Division 2 locations, etc.
- It was felt that although certain installations required the use of such equipment, i.e. certain areas at a sewer-



age disposal plant, etc, municipal electrical engineers could not make useful contributions at meetings of committees.

The projects in question are the following:

787/50010; 789/50020; 787/50030; 787/50070;  
787/50100; 787/50130 and 787/50160.

5.1 Met die aftrede van mnr J V (Ian) Grant is mnr I P Kruger tot die pos van Direkteur, Elektriese Ingenieurswese bevorder en dit is net van pas dat die VME0 se gelukwense aan mnr Kruger op rekord geplaas word.

5.2 Mnr A N Kinman en J E Thoms is ook as afdelingshoofde van die Afdelings Elektriese Tegnologie en Kragverspreidingstegnologie onderskeidelik aangestel.

5.3 Vanweë verdere herorganisasie is sekere projeknummers gewysig. Sover moontlik word alle nuwe projeknummers in hierdie verslag aangegee.

#### 6. Vorderingsverslae/Progress reports

Ek wil graag van hierdie geleentheid gebruik maak om alle betrokke personeel van die SABS te bedank vir hulle aandeel aan die verslag.

During the period under review the following SABS technical committees, on which the AMEU is represented, have been active. (The headings start with the project number followed by a description of the project. The name of the representative who submitted the report is shown in brackets at the end of the report.)

#### 6.1 361/50280: Isoleerolie vir transformators en skakeltoeg: Voorgestelde hersiening van SABS 555

Die finale vergadering is gedurende November 1984 gehou en die wysigings is gedurende Mei 1985 deur die Raad van die SABS goedgekeur en die gewysigde spesifikasie SABS 555-1985 is reeds gepubliseer. (G J NORTJÉ)

#### 6.2 381/50170: Nie-metaalleyppe en -toebehoere (vir elektriese bedrading)

Soos in my vorige verslag vermeld, is die SABS op 17 Desember 1984 per brief in kennis gestel dat ek die VME0 se verteenwoordiger op hierdie komitee is. In daardie stadium was die konsep-spesifikasie reeds gereed vir voorlegging aan die Raad.

Ek het nog geen korrespondensie van die SABS oor hierdie projek ontvang nie, maar die spesifikasie is in November 1985 goedgekeur. (J J BOSHOFF)

#### 6.3 713/50220: Land mobile communication equipment

The Council of the SABS approved a standard specification for the above project on 22 May 1985 and it was published under SABS 1069-1985. An amendment was circulated on 7 October 1986 for comment and this is now being processed to be laid before Council. (SABS)

#### 6.4 763/51010: Bedradingskode: Werkgroep 4

Een vergadering is gehou en wel op 18 Oktober 1985 waartydens 'n aantal wysigings onder andere betreffende die magtigingsprosedure ten opsigte van nuwe kommoditeite voorgestel is.

Tydens 'n vergadering van die Hoëveldtak van die VME0 is daar besluit dat die aangeleentheid betreffende bepalinge in die bedradingskode wat met bepalinge van regulasies, onder die Beroepsveiligheidswet uitgevaardig, ooreenstem, na die SABS verwys moet word vir opvolging deur Werkgroep 4.

In opvolging van bogenoemde besluit het ek die gebruikskode deurgewerk en 'n opsomming van alle bepalinge wat volgens my mening met die wet ooreenstem, gemaak.

Die meeste van hierdie ooreenstemmings behels wysigings na toestelle wat nie per definisie in die wet as deel van die

elektriese installasie beskou kan word nie.

Ek het die opsomming by bogenoemde vergadering van die werkgroep voorgelê en, hoewel dit uiteraard nie onvoorbereid in detail bespreek kon word nie, het dit tog 'n bespreking uitgelok, en die SABS het onderneem om die aangeleentheid verder te ondersoek en konsep-wysiging op te stel.

Sedert bogenoemde vergadering is voorstelle vir wysigings op regulasies 4.6.3(a) en 4.6.4(a) wat deur mnr Fortmann by 'n Hoëveldtakvergadering voorgelê is, ook na die SABS deurgeestuur vir plasing op 'n volgende agenda.

#### 6.5 764/50010: PVC-insulated electric cables and flexible cords

This project is being revised and the target date for submission to the Council of SABS for approval is March 1988. (SABS)

#### 6.6 764/50060: Cross-linked polyethylene (XLPE)-insulated electric cables

Second amendment was approved by the Council of the SABS on 5 November 1986 in respect of (a) changing the requirements for core-screening and for semi-conducting bedding tape; (b) introducing the option of providing a collective metallic screen over the cores of 3-core Type A and Type B cables; (c) introducing a requirement for volume instead of linear resistance of conductor screen and core screen and (d) making reference to SABS 1411: Part I in respect of the requirements for conductors. (SABS)

'n Aantal wysigings van bogenoemde spesifikasie is ooreweg en daar is ooreengekom dat die volgende veranderings aangebring behoort te word:

(a) dat daar weggedoen word met gemeenskaplike afskerming van kabelare en dat slegs kabels met individueel afsgermde are vervaardig word;

(b) dat die gebruik van 'n halfgeleidende band tussen bogenoemde metaalskerm en die uitgepersde halfgeleidende geleierskerm verpligtend gemaak word;

(c) dat die minimum gemiddelde dikte van die uitgepersde geleierskerm na 1 mm vermeerder word;

(d) dat die resistiwiteit van die uitgepersde geleierskermmateriaal voorgeskryf word eerder as die weerstand van die skerm.

Hierdie veranderinge is dan ook onlangs (November 1986) as wysiging nr 2 deur die SABS Raad goedgekeur.

Oorweeging is ook geskenk aan die skraping van die huidige vereistes t o v die identifikasie van die halfgeleidende band asook die identifikasie van die kabelare. Dit lyk egter nie asof hierdie voorstelle aanvaar sal word nie. (J D DE VILLIERS)

No meetings were held during the period in question.

Correspondence was conducted during February 1987 regarding minor amendments to Clauses 5.7.2 "core screens" and 5.8 "core identification" in the form of proposed amendments made by the SABS and which were scheduled to be taken up in SABS 1339.

The proposed deletion of core identification was not supported, however. (A H L FORTMANN)

#### 6.7 764/50120: The selection, handling and installation of electric power cables of rating not exceeding 33 kV Parts I to VI

This project is currently being finalised for Council approval in November 1987. (SABS)

This is a Code of Practice and the SABS requested whether AMEU would continue the work as they want to stop unproductive work from their point of view. The AMEU Executive decided not to go on with this project. (P J BOTES)



- 6.8 **764/50140: System protection and control cables**  
This project was frozen on 21 June 1983 pending the results of Project No 764/50560. (SABS)
- 6.9 **764/50560: Materials of insulated electric cables and flexible cords**  
The former project was Project No 761/50560 with Part I, "PVC" and Part III, "XLPE".  
This project was sub-divided and given a new title.  
The new title is "Materials of insulated electric cables and flexible cords".
- |   |                   |
|---|-------------------|
| Part I : Conductors                                   | Project 764/50580 |
| Part II : Polyvinylchloride                           | Project 764/50590 |
| Part III : Elastomers                                 | Project 764/50600 |
| Part IV : Cross-Linked polyethylene                   | Project 764/50610 |
| Part V : Non-halogen materials<br>(provisional title) | Project 764/50620 |
| Part VI : Armour                                      | Project 764/50630 |
- For the purpose of continuity as well as administration purposes, it was proposed at a meeting held on 12 March 1986 that that particular meeting should not be regarded as the first meeting, but a chronological followon to the meetings held before the sub-division of the former project No 764/50560 and the title changed. It should therefore be the fourth meeting of the committee.
- Prior to the sub-division of 764/50560 there were only two parts, namely Part I "PVC" and Part III "XLPE". "Conductors" and the last-mentioned part were included in the overall "Conductors of insulated electric cables and flexible cords."
- At the meeting of the Council of the SABS held on 6 November 1985 the Projects Committee approved the sub-division of this project into six parts each dealing with a different aspect of the subject.
- The fifth meeting was held on 22 April 1986 when Parts IV and V were considered.
- In June 1986 correspondence was conducted on proposed draft specifications for Parts IV and II.
- Comments were invited on the draft specifications for Parts IV and V during July 1986.
- Part I was approved by the Council of the SABS and was available for purchase during July 1986.
- During October 1986 correspondence on Parts IV and II was conducted.
- In March 1987 correspondence was conducted on Part I. (A H L FORTMANN)
- 6.10 **764/50570: Aerial bundled conductor systems**  
SABS 1418: Part I-1986 "Aerial bundled conductor systems Part I: Cores" (Project No 764/50640) was approved by the Council of the SABS on 5 November 1986. A proposed amendment has been sent out to committee for comment in respect of the deletion of the 150 mm<sup>2</sup>-phase conductor and to facilitate the use of the same tension and supporting fittings for both the 54,6 and 70 mm<sup>2</sup> supporting cores.  
SABS 1418: Part II-1986 "Aerial bundled conductor systems Part II: Assembled insulated conductor bundles" (Project No 764/50650) was approved by the Council of the SABS on 5 November 1986.  
"Aerial bundled conductor systems Part III: Suspension and tension fittings" (Project No 764/50660) is in course of preparation and the target date for approval by the Council of the SABS is March 1988.  
"Aerial bundled conductor systems Part IV: Electrical fittings" (Project No 764/50670) is in course of preparation and the target date for approval by the Council of the SABS in March 1988. (SABS)
- 6.11 **763/51020: Graphical symbols for electrical diagrams"**  
Council has been requested to approve the re-activation of this project as well as a re-constitution of the committee. Subject to approval, the target date for completion of this project is January 1989. (SABS)
- 6.12 **763/51030: Plugs, socket-outlets and socket-outlet adaptors**  
This project is awaiting Council approval for re-publication in the Government Gazette for a comment period of two months. If no further comments of a technical nature are received, the SABS will advise the Minister of Economic Affairs and Technology to declare this compulsory specification operative.  
Draft was published for comment in Government Notice No 2093 of 31/10/86. (SABS)
- 6.13 **763/51050: Wall and appliance switches**  
Project remains as published until Project No 763/51290 "Electrical Accessories Part III: Wall and appliance switches", in course of preparation, has been finalized and approved by the Council of the SABS. (SABS)
- 6.14 **763/51060: Two-pole and earthing pin plugs and socket-outlets**  
Remains as published until Project No 763/51290 "Electrical Accessories Part IV: Two-pole and earthing pin plugs and socket-outlets", in course of preparation, has been finalized and approved by the Council of the SABS. (SABS)
- 6.15 **763/51070: Electrical terminals and connectors Part I: Terminal blocks having screw and screwless terminals.**  
Has been finalized and will be submitted to the Council of the SABS for approval in August 1987. (SABS)
- 6.16 **763/51080: Wireways for electrical cables Part I: Metallic wireways for wall or ceiling mounting, 763/51170: Part II: Metallic wireways for installation into floors remain as published and 763/51180: Part III: Non-metallic wireways for wall or ceiling mounting has been frozen due to a shortage of staff. (SABS)**
- 6.17 **763/51090: Plugs, socket-outlets and couplers intended for non-domestic use**  
Has been amended to include "Stove connectors for electric cooking appliances" (763/51240). The title has been amended and reads as follows: "Plugs, socket-outlets, couplers and connectors of rated current in the range 16-200 A". This amendment has been submitted to June 1987 Council for approval. (SABS)
- 6.18 **763/51100: Wall outlet boxes for the enclosure of electrical accessories Part I: Standard boxes**  
Remains as published until Project No 763/51290 "Electrical Accessories Part II: Outlet boxes for the enclosure of electrical accessories" has been finalized and approved by Council. (SABS)
- 6.19 **763/51110: Manually operated air-break switches**  
Remains as published until the revision has been finalized, ie gazetted for a comment period of two months and subject to consensus on the technical content thereof, becomes operative by declaration of the Minister of Economic Affairs and Technology.
- 6.20 **763/51120: Cover plates for wall outlet boxes**  
Remains as published until Project No 763/51290 "Electrical Accessories Part I: Cover plates for wall outlet boxes" is finalized and approved by the Council of the SABS. (SABS)

6.21 **763/51010: The wiring of premises (Main Committee)**  
Has been revised and has been submitted to the Council of the SABS for approval in June 1987.

6.22 **763/51130: International plug and socket-outlet system**  
This project has been cancelled at the request of the committee and will be covered by Project No 763/51290: Electrical Accessories Parts I to IV" i.e. Projects No 763/51050, 763/51060, 763/51100 and 763/51120 which have been consolidated to form Project No 763/51290. (J A LOUBSER)

6.23 **Compulsory Specification for cord extension sets** was published in Government Gazette No 10391 by Government Notice No 1736 dated 22 August 1986 and declared operative on a date two months after the date of Government Notice 283 dated 13 February 1987. (SABS)

6.24 **763/51270: Compulsory Specification for electrical distribution boards**  
In course of preparation and the target date for submission to Council for approval to publish this specification in Government Gazette for a comment period of two months is November 1988. (SABS)

6.25 **771/50030: Low-voltage air-break switches, air-break disconnectors, air-break switch-disconnectors and fuse combination units**  
Amendment No 1 was published in March 1987. (SABS)

6.26 **771/50040: Moulded-case circuit breakers**  
In August 1985 correspondence was conducted on amendments to SABS 156-1977 to include the use of additional symbols and graphic symbols. Clarification is given where difficulty in the interpretation of breaking capacity results was being experienced.

These proposed amendments were acceptable to the AMEU.

On 17 September 1985 the first Committee meeting was held for the consideration of the proposed amendments. The amendments were finalised and the project completed. (A H L FORTMANN)

6.27 **772/50100: Metal-enclosed busbar trunking systems**  
Amendment No 1 approved by the Committee in April 1987. (SABS)

6.28 **772/50520: Uninterruptible power systems (ups)**  
Second draft being prepared for Committee meeting in August 1987. (J D ALGERA)

6.29 **772/50150: Earth leakage protection units: Part III Earth leakage relays**  
Die eerste vergadering van die Tegniese Komitee is gehou op 6 Augustus 1985 en daar is besluit dat daar gepoeg sal word om hierdie spesifikasie so veel as moontlik in ooreenstemming te bring met SABS 156 en SABS 767 Dele I en II. As gevolg van 'n tekort aan personeel vorder die projek stadig. (J A LOUBSER)

6.30 **772/50530: Verpligte veiligheidsespeifikasies vir aardlekbeveiligingseenhede en stroombrekers met gevormde hulse**  
Die doel van hierdie verpligte veiligheidsespeifikasies is om toerusting te dek wat ingevoer word en dus nie die SABS-merk kan kry nie. Sodra hierdie verpligte veiligheidsespeifikasies afgekondig is, sal dit onwettig wees om stroombrekers en aardlekeenhede wat nie daaraan voldoen nie, hier te verkoop. Die onus is op die verspreider om te verseker dat die toerusting hieraan voldoen en hy moet bewyse lewer, indien nodig, dat dit wel daaraan voldoen.

Daar kan op gelet word dat 'n aardlekstroombreker nie oor oorstroombeskerming hoef te beskik volgens die definisie nie. Aardlekeenhede sal duidelik deur die vervaar-

diger gemerk moet word om aan te dui of dit slegs 'n diskonnekteerder met aardlekbeveiliging is en of dit oorstroombeveiliging het. (A H L FORTMANN)

6.31 **783/50040: Tungsten filament general service electric lamps Rev 2**  
Amendment 2 regarding the marks on bulbs was approved on 5 November 1986. (SABS)

6.32 **783/50050: Ballasts for low-pressure sodium vapour and high-intensity discharge lamps**  
Amendment 3, to cover 150 W high-pressure sodium lamps, was approved on 5 November 1986. (SABS)

6.33 **783/50100: Ballasts for fluorescent lamps and fluorescent lamp reference ballasts Rev 1**  
In August 1985 the specification SABS 890 "Ballasts for fluorescent lamps" was amended to allow for a temperature rise of 60°C on any winding under normal conditions. A request was received to allow a rise of 65°C which was opposed by us because of the high ambient temperature in this country. (P J BOTES)

6.34 **783/50140: Tubular fluorescent lamps for general service Amendment 2**  
Some minor alterations to bring the specification in line with the latest issue of IEC Publication 81 have been done. Simultaneously two small additions to the test procedure for Class B lamps to accentuate aspects which are frequently overlooked and following the IEC to add a capacitor to the test circuit for Class A lamps, were also accepted. (J A LOUBSER)

6.35 **783/50160: Street lighting luminaires Amendment 1**  
Amendment 1 to incorporate 70 W and 150 W high-pressure sodium lamps was approved on 3 June 1987. (A J VAN DEN BERG)

6.36 **783/50350: High-pressure mercury vapour lamps**  
The inclusion of life tests was not accepted as this will take too long. Closing date for comments was 12 December 1986 and the final document was approved by the SABS Council on 4 March 1987. (J K VON AHLFTEN)

6.37 **791/50110: Ceramic and glass insulators for overhead lines of nominal voltage greater than 1000 V**  
"Ceramic and glass string insulator units and insulator strings and sets for overhead lines". This standard, to be published this year, is a part revision of SABS 177 covering string insulator units and assemblies only. The revision of the remainder of SABS 177 to be completed by 1988. (SABS)

6.38 **791/50120: Low-voltage insulators of ceramic, glass and synthetic insulating materials**  
It would not appear that there is a need for the revision of the existing standards SABS 161 and SABS 176.

**SABS 161-1955 "Low-voltage porcelain insulators"** covers telephone insulators and LV pin, reel and schackle insulators.

**SABS 176-1953 "Porcelain cleats, bobbins and leading-in tubes"** covers insulators partly used for overhead service connections and for open house wiring.

Many of the above commodities are out of date or have been replaced by plastic insulators. The need for standardization does not seem to be pressing. It would be appreciated if the AMEU would pass the following proposals:

- that the project for the preparation of a standard combining SABS 161 and 176 and including plastic insulators be cancelled, and
- that it will be left to the SABS to rationalize the exist-

ing standards by amendment or withdraw as deemed fit. (SABS)

**6.39 791/50160: Insulation co-ordination and standard voltages and currents for electrical power supply**

SABS 1019-1985 "Standard voltages, currents and insulation levels" covers the standard reticulation voltage of 220 V and the IEC alternative 240 V. It also contains the IEC recommendation that systems should eventually merge into a universal standard voltage of 230 V.

The AMEO representation does include neither Pretoria nor Port Elizabeth. It is recommended that the AMEO appoint additional representatives for these two cities and request the SABS to form a subcommittee to make firm recommendations with regard to the adoption of the standard 230 V. It is recognised that this is a matter of some urgency. (SABS)

**6.40 791/50180: Kragtransformators**

Die posisie is dat die SABS-personeel nog besig is om aan 'n konsepstandaardspesifikasie te werk. Sodra dit gereed is, sal dit versprei word, waarna die eerste vergadering van die werkgroep gehou sal word. (C A ANDERSON)

**6.41 791/50220: Low-voltage surge arresters**

SABS 171-1986 "Surge arresters for low-voltage distribution systems" has been issued. It covers both gapped arresters and metal oxide varistors (MOV). The inclusion of MOV's may need further attention as the latter will provide better protection in house, commercial and industrial installations with ever increasing pressure on providing protection for computer installations. (SABS)

**6.42 791/50230: Compact transformer substations for use in public areas**

A first draft revision of SABS 1029 "Miniature substations" and of SABS 1030 "Standard longitudinal miniature substations of rating not exceeding 315 kVA" are in preparation.

**6.43 713/50220: Land mobile communication equipment**

The Council of the SABS approved a standard specification for the above project on 22 May 1985 and it was published under SABS 1069-1985. An amendment was circulated on 7 October 1986 for comment and this is now being processed to be laid before Council. (SABS)

**6.44 733/50110: Fixed electric storage water heaters (Safety Specification)**

Amendment 4 in progress. The Committee met on 12 February 1986. The proposed amendment was circulated on 8 August 1986. After consideration of comments received, a revised document was circulated on 10 December 1986. The comments received, are being considered. (A J VAN DEN BERG)

**6.45 733/50130: Electric kettles and similar portable appliances for heating liquids**

Nadat verskeie vergaderings gehou is, is 'n konsep-spesifikasie uitgestuur vir kommentaar. Die kommentaar is reeds ontvang en bygewerk en die spesifikasie word huidige voorberei vir voorlegging aan die SABS-Raad, moontlik tydens die sitting in Augustus 1987. (W A KRIGE)

**6.46 733/50140: Electric stoves and hotplates (Schedule 8) (Safety Specification)**

An amendment is being processed. A meeting was held on 21 August 1986 and a proposed amendment published in the Government Gazette No 2534 of 5 December 1986. The comments received were circulated to the Committee on 14 April 1987. (SABS)

Only one meeting was held since the first meeting in 1982, namely on 30 April 1986. At this meeting it was agreed

that -

(a) all stoves above 16 amperes be suitable for 3-phase systems;

(b) separate ovens or hobs above 16 amperes to be suitable for 2-phase systems and those above 32 amperes for 3-phase systems;

(c) the compulsory over-current device in fixed stoves over 15 amperes be dispensed with.

The proposed amendments will be prepared for publication in the Government Gazette. (J H DAVIES)

**6.47 733/50150: Safety requirements for electric appliances**

Being processed as draft for comment. (SABS)

**6.48 733/50160: Lampholders and lampholder adaptors (Schedule 9) (Safety Specification)**

Dormant. The project was transferred back to the Electrical Appliances Division from Lighting Technology and allocated a different number. It is now 733/50500. (SABS)

**6.49 733/50190: Thermostats for electric storage water heaters**

Proposed amendment is being investigated. The Committee has been requested to submit their comments. (A J VAN DEN BERG)

**6.50 733/50250: Domestic electric laundry treatment machines**

After being circulated as a draft for comment on 28 February 1986, SABS 1422-1987 was approved by the SABS Council on 4 March 1987. (J K VON AHLFTEN)

**6.51 733/50380: Electric stoves, cooking tops, ovens, grills and similar appliances**

Amendment No 1 published on 5 June 1986. (SABS)

**6.52 733/50440: Electric light dimmers**

Transferred to Power Distribution Technology Division of Electrical Engineering Department. New project No 764/51440. (SABS)

**6.53 791/50290: Die ontwerp en installering van 'n aardelektrode**

Gefinaliseer en gepubliseer as SABS 0199-1985. Die inhoud van beide Aanhangel E en Tabel E-1 is hoofsaaklik afhanlik van hydraes gemaak deur die S A Elektrolitiese Verweringskomitee. (G H DAWES)

**6.54 791/50300: Neutral earthing in medium voltage industrial power systems**

Finalised and published as SABS 0200-1985. Reference is made to Appendix E contained in SABS 0199-1985 regarding corrosive behaviour of certain metals, again a contribution of the Electrolytic Committee. (G H DAWES)

**6.55 791/50310: Die toepassing van beskermende meervoudige aarding om laespanningstelsels**

'n Nuwe konsep is nou aan uitvoerende raadslede gesirkuleer vir hul kommentaar. Die konsep is opgestel deur die SAIEE.

In Tegniese Bulletin nr 8: Handleiding insake Elektrolitiese Wegvretting, opgestel deur mnr CJ van Rooy van die S A Vervoerdienste in opdrag van die S A Elektrolitiese Verweringskomitee, word beskermde meervoudige aarding van huishoudelike toevoere as 'n bron van swerfstroming met verskeie nuwe-effekte identifiseer.

Voortspruitend hieruit het lede op die Hoof- en Streeks-Elektrolitiese Verweringskomitee-vergaderings die noodsaaklikheid beklemtoon dat Aanhangel E van die SABS 0199-1985 gebruikskode by die nuwe VMEO-konsepgebruikskode vir die "Toepassing van beskermende meervoudige aarding om laespanningstelsels" ingevoeg word.

Die doel hiervan is hoofsaaklik om munisipale elektrotrog-

niese ingenieurs se aandag op wegvreting deur veelvuldige aarding veroorsaak, te vestig. (G C DU PLESSIS)

6.56 851/51830: Metaalleipype en -toehore (met skroefent en met gladde ent) vir elektriese bedrading

Deel 1: Metaalleipype - SABS 1065-1985 Deel 1  
Hierdie spesifikasie is op 27 Februarie 1985 goedgekeur en 'n paar kleiner wysigings is gedurende Maart 1986 goedgekeur. (J J BOSHOFF)

6.57 851/51840: Metaalleipype en -toehore (met skroefent en met gladde ent) vir elektriese bedrading

Deel 2: Metaaltoehore - SABS 1065-1986 Deel 2  
Hierdie spesifikasie is gedurende Maart 1986 goedgekeur. (J J BOSHOFF)

PROGRESS REPORTS ON IEC ACTIVITIES  
VORDERINGSVERSLAE OOR IEK-WERKSAAMHEDE

TC14 - TC 28 (D H FRASER, DURBAN)

1. Technical Committee No 14: Power Transformers

As far as I am aware there has been no activity of this committee during the period under review.

2. Technical Committee No 28: Insulation Co-ordination

In response to a request for proposals from the various National Committees for the revision of IEC publications 71-1, 71-2 and 71-3, numerous suggestions and points of view were submitted to the IEC and a survey of these comments was distributed for information in May 1985.

On 23 and 24 May 1985 a meeting of Technical Committee No 28 was held in Montreal, Mr J C van Alphen being the South African delegate. The proposed revision of publications 71-1, 71-2 and 71-3 was discussed and it was agreed at this meeting to set up two Working Groups, namely:

- WG-1: The revision of insulation co-ordination between phases and earth, and between phases. The task of this group was to write a new standard combining into one document the existing publications 71-1 and 71-3, revising where required.
- WG-2: The revision of the Application Guide for insulation co-ordination. This group would commence work on the most important aspects of the revision of the Application Guide, combining into one document the appropriate sections of the existing publications 71-2 and 71-3.

It was also agreed to set up an Advisory Group whose task was to determine and report on the requirement for further work to be done in the field of DC insulation co-ordination.

A further meeting of Technical Committee No 28 is to be held in Sydney from 1 to 3 October 1987, at which the reports and draft documents prepared by the above Groups will be discussed.

TC 23E - TC34 - TC34A-D - TC61 - TC61C and TC61D  
(J K VON AHLFTEN, SPRINGS)

TC23	- Circuit breakers and similar equipment	- No special comments
TC34	- Lamps and related equipment	- No special comments
TC61 and TC61D	- Safety of household and similar appliances	- No special comments

Relevant documentation has been regularly perused and in the majority of cases the SABS has supported the proposed amendments under the six-month rule without comments.

TC23B - TC23C - TC64 (J A LOUBSER, BENONI)

TC64 - Elektriese installasies van geboue

Die werk van hierdie Komitee met al sy verskillende werkgroepe gaan steeds voort. Sedert die vorige keer verslag gedoen is, is daar twee vergaderings gehou, naamlik gedurende Oktober 1985 in Dubrovnik, Yugoslavia en gedurende Junie 1986 in Stockholm, Swede.

Publikasies wat sedertdien die lig gesien het en beskikbaar is by die SABS, is die volgende:

Publication 364-7-703: Electrical installations of buildings - Part 7: Requirements for special installations or locations - Section 703 - Locations containing sauna heaters.

Publication 364-7-705: Electrical installations of buildings - Part 7: Requirements for special installations or locations - Section 705 - Electrical installations of agricultural and horticultural premises.

Publication 364-7-707: Electrical installations of buildings - Part 7 - Requirements for special installations or locations - Section 707 - Earthing requirements for the installation of data processing equipment.

Publication 479-1 (Second edition - 1984): Effects of current passing through the human body - Part 1: General aspects - Chapter 1: Electrical impedance of the human body - Chapter 2: Effects of alternating current in the range of 15Hz to 100 Hz - Chapter 3: Effects of direct current.

Publication 364-5-53: Electrical installations of buildings - Part 5: Selection and erection of electrical equipment - Chapter 53: Switchgear and control gear.

Publications 364-6-61: Electrical installations of buildings - Part 6: Verification - Chapter 61: Initial verification.

Publication 479-2: Effects of current passing through the human body - Part 2: Special aspects. Chapter 4: Effects of alternating current with frequencies above 100 Hz. Chapter 5: Effects of special waveforms of current. Chapter 6: Effects of unidirectional single impulse currents of short duration (Second Edition 1987).

Ongelukkig was Suid-Afrika nie verteenwoordig by die laaste twee vergaderings van TC64 nie. Die Suid-Afrikaanse Nasionale Komitee het ook nie vergader in die afgelope twee jaar nie, behalwe gedurende Mei van hierdie jaar toe 'n herorganisasievergadering belê is. Tydens hierdie vergadering is metodes bespreek waarvolgens die Voorsitter en Sekretaris nie noodwendig werknemers van die SABS hoef te wees nie maar ook ander belangstellendes kan wees. Verder sal positiewe bydraes deur die Suid-Afrikaanse Nasionale Komitee ook verseker word.

TC23C - Internasionale kontakprop- en sokstelsel

Na baie jare van stry en baklei is die werk uiteindelik afgehandel en IEK Publikasie 906-1 is beskikbaar onder die titel "IEC System of Plug and Socket Outlets for Household and Similar Purposes. Part 1: Plugs and Socket Outlets 16 A 250 V a.c." Afskrifte is by die SABS beskikbaar.

Die slegte nuus is egter dat net enkele lande aanvanklik die nuwe sisteem aanvaar het. Die jongste nuus is darem dat meer lande nou oorgaan na die internasionale sisteem.

Wat Suid-Afrika betref, is ek jammer om te rapporteer dat ons nog steeds nie besluit het om na die nuwe internasionale sisteem oor te skakel nie. As daar gedink word dat die voordele wat hierdie kleiner kontak sok- en propstelsel tesame met nuwe bedradingstelsels inhou, veral nou wanneer daar soveel klem gelê word op die derduisende huise wat in die volgende paar jaar gebou sal moet word, dan sal iets nou dringend gedoen moet word.

Sou die regte oplossing nie wees om die nuwe internasionale stelsel nou te aanvaar en dit dan tesame met die huidige stelsel te gebruik vir 'n dekade of meer nie?

TC23B

No special comments

TC61B - Household and similar electrical appliances  
(J H DAVIES, JOHANNESBURG)

No special comments



**TC23 – TC59 – TC59A – TC59H (P J BOTES, ROODEPOORT)**

Die meeste voorstelle gaan oor hoe dinge gedoen moet word en tot dusver het geen beduidende voorstelle na vore gekom nie.

**TC14 (C E ADAMS, PORT ELIZABETH)**

No special comments

**TC8 (C A ANDERSON, PRETORIA – VOORHEEN  
E DE C PRETORIUS, POTCHEFSTROOM)**

Die 50ste Algemene Vergadering van die Internasionale Elektriese Kommissie (IEK) is van 1 tot 9 Oktober 1986 in Wes-Berlyn gehou. Ek het die voorreg gehad om, op koste van die VMEO, deel uit te maak van die Suid-Afrikaanse afvaardiging. Die ander lede van die afvaardiging was:

Dr C Johnston, SABS (leier)

Mnr I Kruger, SABS

Mnr R Filippini, SABS

Mnr J A Loubser, President van die VMEO en

Mnr G D Bishop, Tedex

Die vergadering is bygewoon deur 36 IEK-lidlande uit 'n totaal van 42. Suid-Afrika, Egipte en Tunisië is die enigste lidlande in Afrika: al drie het hierdie 50ste vergadering bygewoon. (Tunisië het maar eens in 1986 lid geword).

Ek het die vergaderings van die komitees belas met Grafiese Simbole asook die vergadering van die Aksiekomitee en dié van die Raad bygewoon. Die vergaderings was baie interessant hoewel die klem van die Grafiese Simbole-komitee op elektronika gelê het.

Dr Eicher, Sekretaris-generaal van die Internasionale Standarde-organisasie, het die raadsvergadering toespraak oor die onderwerp "Nuouer samewerking tussen die IEK en ISO".

Op die raadsvergadering is mnr G R C McDowell van die Verenigde Koninkryk tot nuwe president van die IEK verkies.

Volgens rooster het Sjina, Italië, die Verenigde Koninkryk en Joegoslavië uit die Aksiekomitee getree. In hulle plek is Australië, Frankryk, Nederland en Rusland verkies.

Die 51ste (1987-) algemene vergadering van die IEK word in Julie 1987 in Praag gehou. Vir die 52ste (1988-) algemene vergadering is daar 'n uitnodiging ontvang van Australië/Nieu-Seeland sowel as Turkye. Die aangeleentheid is verwyd na die Algemene Beleidskomitee wat in Januarie 1987 'n besluit moet neem watter een van die twee uitnodigings aanvaar word.

Ek en mnr Loubser het ook van die geleentheid gebruik gemaak om saam tegniese besoeke mee te maak wat baie interessant

was. Een so 'n besoek was aan die fabriek van een van die grootste elektriese maatskappye in Duitsland; dit was 'n riem onder die hart om te ervaar dat daar nog soveel welwillendheid teenoor Suid-Afrika is van so 'n wêreldreus.

Wat die sosiale sy betref, was daar genoegsame voorsiening. By hierdie geleentheid het ons ons kans waargeneem om die verwoorde (en soms lagwekkende) beelde van die Suid-Afrikaanse situasies in die regte perspektief te stel.

Ek is die VMEO baie dank verskuldig vir die geleentheid om hierdie IEK-vergadering te kon bywoon. Dit was voorwaar 'n groot voorreg. (E DE C PRETORIUS)

7. On behalf of my Committee and myself I wish to thank all those AMEU representatives on SABS technical committees and working groups who, quite often under difficult circumstances and pressure of work, devotedly and diligently study the SABS documents they receive, submit their comments and/or attend committee meetings. Thank you also to those who have submitted progress reports without which it would have been impossible to compile this report.

I also wish to thank those local authorities who employ these representatives for the opportunities afforded to them to carry out this work which is of national interest.

8. Weens die ligging van die SABS se setel en die gevolglike afstandprobleem word VMEO-verteenwoordigers in SABS-komitees hoofsaaklik uit die Hoëveldtak benoem, wat natuurlik 'n geweldige werklas op hulle plaas.

9. Ek wil weer eens VMEO-lede aanraai om in te teken op die SABS-bulletin wat u op die hoogte hou van die doen en late van die SABS, nuwe spesifikasies, spesifikasiewysings en dies meer en wat ook interessante artikels oor standarde en verwante sake bevat.

10. In conclusion I wish to reiterate what was said in previous reports: We, the AMEU, must regard the SABS as one of our most loyal and powerful allies in our aspirations to offer our electricity consumers only the best service. But the SABS is virtually powerless, if we do not co-operate by ourselves in turn being loyal to and promoting the image of the Bureau: being mark-conscious is one very simple way to accomplish this.

A J VAN DEN BERG PR ING  
(Sameroeper/Convenor)

**MNR AJ VAN DEN BERG: KRUGERSDORP**

Mnr die President, op bladsy 2 van my verslag onder item 5.2 word melding gemaak van die aanstelling van mnr AN Kinman en JE Thomas as afdelingshoofde van die Afdelings Elektriese Tegnologie en Kragverspreidingstegnologie onderskeidelik. Ek wil graag die VMEO se gelukwense aan hulle op rekord plaas. Neem ook asseblief kennis dat mnr Thoms se van verkeerd geskryf is, mnr die President.

Ek wil ook van hierdie geleentheid gebruik maak om alle betrokke personeel van die SABS te bedank vir hulle groot aandeel aan die verslag. U sal opmerk dat meeste kommentaar en mededelings deur die SABS aan my besorg is waaronder die verslag nie volledig sou wees nie.

On behalf of my Committee and myself I wish to thank all those AMEU representatives on SABS technical committees and working groups who quite often under difficult circumstances and pressure of work, devotedly and diligently study the SABS document they receive, submit their comments and/or attend committee meetings. Thank you also to those who have submitted progress reports without which it would have been impossible to compile this report.

I also wish to thank those local authorities who employ these representatives for the opportunities afforded to them to carry out this work which is of national interest.

Daar bestaan nog by sekere VMEO verteenwoordigers on-

duidelikheid oor watter projekte hulle die VMEO verteenwoordig op SABS komitees. Hierdie aangeleentheid sal binnekort reggestel word.

Mr President, I must also direct your attention to item 6.39 on page 10, Project 791/5960: *Insulation co-ordination and standard voltages and currents for electrical power supply.*

SABS 1019-1985 "Standard voltages, currents and insulation levels" covers the standard reticulation voltage of 220 V and the IEC alternative of 240 V.

Mention is made by Mr JC van Alphen, Manager of the High Voltage Engineering Department of the SABS that neither Pretoria nor Port Elizabeth are represented on the AMEU representation and as this matter is rather urgent requested representatives from the cities of Pretoria, Johannesburg, Durban and Port Elizabeth to conclude the project.

I am happy to report that Messrs CJ Scherman (Pta); RA Leigh (Jhb); DH Fraser (Durban) and CE Adams (Port Elizabeth) or their nominated representatives will serve on this committee.

Met betrekking tot item 6.55 op bladsy 12, mnr die President.

Projek 791/50310: Die toepassing van beskermende meervoudige aarding om laespanningstelsels moet ek verwyd na die aandeel wat die SAIET met die opstel van 'n konsep gebruikskode gehad het en mnr EG Davies van Pietermaritzburg word bedank vir sy persoonlike rol om hierdie gebruikskode te finaliseer.



Mnr die President – Die laaste maar beslis nie die geringste nie, wil ek u verwys na item 3 op bladsy 1 van my verslag en wil ek graag die naam van mnr E de C Pretorius (Erelid) uitsonder en hom namens die Komitee bedank vir die wysse waarop sy pligte as Sameroeper met groot toewyding en nougesetheid uitgevoer het en hy word hartlik bedank vir sy deelname en leiding.

Dankie, mnr die President.

#### TREVOR GAUNT: AFFILIATE

My question relates to the standards which, according to the SABS, was discontinued as one of their own standards that is the SABS 1500 and 0150 series on the grounds that AMEU was going to take responsibility for them and I think many of us would appreciate hearing a report or progress report on these standards. I think that the standards are very important to us and unlike lawyers, who when you ask them for an opinion, they have a 50% chance of being right and a 50% chance of being wrong, because they fight each other in court. Engineers have to be right all the time so the standards that we use are very important to us.

In November last year in the SABS Bulletin it was mentioned that the standard specification for electrical works and the Code of Practice for the design of electrical reticulation systems were no longer going to be SABS documents and furthermore that these documents would in future be the responsibility of the AMEU to administer and keep up to date and issue.

#### PRESIDENT

Mr von Ahlften could you please comment on this as Convenor of the Guidelines Updating Committee?

#### MR JK VON AHLFTEN: SPRINGS

Certainly mr President.

When the guidelines for the provision of engineering services had to be updated, we received a letter from the SABS stating that the SABS 1500 and 0150 series would be withdrawn. I went back to the Building Research Institute and requested them to take the matter up with the Housing Advisory Committee with the recommendation that the administration of these specifica-

tions together with the guidelines should not be discontinued but be administered by the Bureau in future. This has not gone through yet but I believe that this will be submitted to the Bureau by the Main Updating Committee of the NBRI. You may recall that when our Committee brought this to the attention of the NBRI, Mr Crabtree wrote back to us and agreed with us that these standardised specifications should not be withdrawn. Although the AMEU will partake in the updating of the documents we most certainly will not administer the documents. We don't have the administrative machinery for this and Mr Crabtree, Deputy Director of the NBRI, has promised that he will take this matter up again with the powers to be and I'm sure that these documents will be kept alive and will be reintroduced and will have to be administered by the S.A. Bureau of Standards. I don't know whether Dr Johnson has any information on this at this point in time but that is the recommendation from our own updating Committee to the Main updating committee which is being supported by the National Building and Research Institute. I don't know whether Dr Johnson would like to add to this.

#### DR JOHNSON: SABS

I don't have anything to add to this I'm afraid. What I wanted to say was that the person from the SABS who probably would know the progress is Mr Isak Kruger who was to have been here today but was delayed and he asked me to submit his apologies to this convention although he registered for it. Something to do with the weather conditions up in the Transvaal I believe, so I'm afraid I have nothing to add but I thought I would just like to let you know the reason for his absence.

#### MR JK VON AHLFTEN: SPRINGS

I may just mention, Mr President, that the Executive Council will also have to consider my report on this matter on Thursday and confirm the Committee's recommendations to the NBRI regarding the future administration to these standards.

#### PRESIDENT:

Thank you Mr von Ahlften. Any other discussion? If not, I would like to thank Mr van den Bergh for his report.

## TECHNICAL TRAINING COMMITTEE: REPORT

### 1. COMPOSITION OF THE COMMITTEE

The following members of the AMEU were appointed to this committee by the Executive Council at its meeting held on the 3rd October, 1985.

NS Botha	– Bloemfontein.
E G Davies	– Pietermaritzburg.
J D Dawson	– Uitenhage.
A H L Fortmann	– Boksburg.
J E Heydenrych	– Middelburg.
J A Loubser	– Benoni.
D C Palser	– Cape Town.

When Mr Palser resigned the Executive Council appointed Mr K Murphy of Somerset West in his place.

At the time of writing this report four meetings of the committee have been held and a further meeting is scheduled to be held before the conference in Cape Town in September.

### 2. AMEU BURSARY SCHEME

On the recommendation of the committee the Executive Council approved the granting of four bursaries; the first to be awarded in 1986, the second in 1987 and so on with the number at any one time not exceeding four.

The original amount approved for each bursary was R5 000

per annum but this has been increased to R6 500 per annum as from 1987.

The 1986 bursary was awarded to Mr A F Strydom of the University of Pretoria and as a result of his satisfactory progress has been extended for 1987. Liaison between Mr Strydom and the AMEU is maintained by Mr J A Loubser.

The 1987 bursary has been awarded to Mr H A Herberstein of the University of Cape Town and in this case liaison between the student and the AMEU will be maintained by Mr K Murphy of Somerset West.

In the case of both bursaries a large number of applications were received and should any member require more details for future bursaries these are available from the Secretariat of the AMEU.

### 3. MERIT AWARDS

For many years the AMEU has made awards to Municipal Training Centres, Technikon and Technical Colleges.

At the moment an award of R250 per annum is made to each of twelve Municipal Training Centres but as the AMEU through the Technical Training Committee has been given the task of setting the minimum standards for the approval of such centres it may be necessary to modify the existing list in the future.

Similar awards were made to Technikon and Technical Colleges but with the proliferation of such institutions this has become financially impractical.

Instead on the 19th March, 1987 the Executive on the recommendation of the committee agreed to make ten awards each year of R200 each to the ten best electrical trainees/ap-

prentices from AMEU member undertakings attending Technikon in the R.S.A. This information will be supplied to the AMEU by the Committee of Technikon Principals. Similarly the Executive has also agreed to make ten awards of R200 each to the ten best electrical apprentices from AMEU member undertakings attending Technical Colleges in the R.S.A. This information will be provided by the Association of Technical Colleges.

As soon as the administration of these awards has been perfected then this will become a routine matter handled each year by the AMEU secretariat.

#### 4. REGISTRATION OF MUNICIPAL TRAINING CENTRES AND SUBSIDIES FOR APPRENTICE TRAINING

In terms of the Local Authorities Training Act No. 41 of 1985 the AMEU has been invited by the chairman of the National Co-ordinating Training Council to set the minimum standards for the registration of training centres of municipal electricity undertakings.

At the Executive Council meeting held on the 3rd September, 1986 it was agreed that the AMEU should accept the role of the approval and registration body for all Municipal Training centres under the provisions of the Local Authorities Training Act No. 41 of 1985.

Authority was delegated to the Technical Training Committee to act in this regard and to endeavour to obtain subsidies for the training of apprentices of member undertakings at such centres.

A detailed investigation was instituted which resulted in the acceptance by the Training Committee of a report by Dr N S Botha, the City Electrical Engineer of Bloemfontein, entitled "Minimum Standards of Technical Training Centres".

This report amongst other matters established the average cost of training each apprentice at a hypothetical training centre made up of the costs incurred by the training centre and the cost incurred by the employer for the wages paid by an employer to an apprentice while attending the training centre.

The following recommendations were submitted to and approved by the Executive Council at its meeting held on the 19th March, 1987.

- (1) That the Technical Training Committee accepts the minimum standards as detailed in the report for Technical Training Centres for apprentices from Municipal Electrical Undertakings as a basis for negotiation when submitting an application to the Training Board.
- (2) That the hypothetical training centre be considered suitable for all other trades in which training by local authorities is undertaken irrespective of the fact that the estimated costs of tools and equipment relate to the

trade of electrician.

- (3) That provision be made for the adjustment of costs caused by escalation on the basis of the SEIFSA index and prevailing market interest rates.
- (4) That the estimated costs per annum (including running costs) for training an apprentice be R12 600 made up of R10 600 for the training centre and R2 000 for apprentice remuneration be accepted as the 100% basis as on 1st January, 1987 for applications for subsidising of training costs.
- (5) That the AMEU apply in terms of the Local Authorities Training Act No. 41 of 1985 for subsidy to compensate for the yearly costs of apprentice training.
- (6) That the modular type Apprentice Training Courses of the Bloemfontein City Council which have been accepted by the AMEU Technical Training Committee as a basis for approved courses, be submitted to the National Training Board as soon as possible for approval and that at the same time the AMEU obtain authority to approve and implement any future changes to the courses.
- (7) That the President and Dr N S Botha be authorised to deal with any problems that may delay the finalising of items (5) and (6) by means of personal contact with the National Training Board.

Subsequent to the Executive Council meeting Dr N S Botha acting in terms of the authority granted by the Executive has submitted an application dated 12th May, 1987 to the National Co-ordinating Training Council requesting approval of the standards of training centres as recommended by the AMEU and for the granting of subsidies for the training of apprentices at such centres.

At the time of writing this report a reply has not yet been received.

#### 6. APPRECIATION

Finally may I place on record my sincere thanks to all members of the committee for their active participation and hard work and in particular to Mr E G Davies of Pietermaritzburg for his work on the bursary and award schemes and to Dr N S Botha for his work on the municipal training centres and subsidies for apprentices.

I am also extremely grateful to Mr M P P Clarke of Randburg who was co-opted onto the committee to provide publicity for the bursary awards and in particular to ensure that all the Universities were made aware of the availability of the AMEU bursaries. The success of his efforts is clearly demonstrated by the large number of applications received.

J D DAWSON  
Convenor

#### MR J.D. DAWSON: UITENHAGE

In the written report I indicated that it was hoped to hold a meeting of the Committee before this conference but circumstances did not warrant this.

It is however necessary to add the following information to the original report.

##### Merit Awards

Difficulties are being experienced with the scheme to make individual awards to learner trainees/apprentices attending technikon and technical colleges and it will probably be necessary to completely re-think this project. Hopefully this will be done in the near future. Member - Gordon Davies, Pietermaritzburg.

##### Registration of Municipal Training Centres and subsidies for apprentice training

In the report I indicated that Dr N S Botha, acting in terms of the authority granted to the committee by the AMEU Executive, submitted on the 12th May 1987 to the National Co-ordinating Training Council an application for the approval of standards for training centres for municipal undertakings and

for the granting of subsidies for the training of apprentices at such centres.

I had hoped to report to this Convention on the success of the application but unfortunately no reply has yet materialised unless Dr Botha has some more information.

It is absolutely essential that municipal electricity undertakings train sufficient technical staff for future requirements and it must be the major task of the 1987/88 Technical Training Committee to make every effort to successfully conclude these projects.

Now I listened to the Minister the other day talking around the same subject and it would appear that the concept of subsidy has slightly changed. I did get the impression that there would be, instead of being purely on a tax rebate principle there would be actually cash allocated to training centres. However, he didn't make it quite clear as far as I could work out whether this would be available to local authorities. He indicated that it would be for the private sector. Hopefully the law itself will allow this rebate to be given to anybody and if that is so then our requirements to have the technical training centres run by local authorities accepted and subsidised could come to fruition.

## PRESIDENT

Thank you Mr Dawson. Dr Botha, is daar enige iets wat u daar wil byvoeg?

## DR N. BOTHA: BLOEMFONTEIN

Mnr die President, volgens my kennis het NASKOK of te wel die Nasionale Koördinerende Opleidingskomitee hierdie saak verwyd na die onderskeie Streekskomitees toe. So al wat ons kan vra is die verteenwoordigers van die Streekskomitees of hulle nie vir ons daar kan bystaan en kan help dat ons hierdie

subsidies vir opleiding kan bekom nie.

## MNR JA LOUBSER: BENONI

Mnr die President, soos u weet, is daar eintlik nie een van VMEO lede op NASKOK nie maar ek het 'n bietjie navrae gemaak by persone wat op NASKOK is en dit blyk dat ons aansoek nie oorwegend gaan word ten volle nie omdat ons by ons aansoek die salarisse van die betrokke vakleerlinge ingesluit het. Die Streekskomitees het in elk geval besluit dat salarisse gaan nie deel uitmaak van die subsidie wat ons kan kry nie. Dankie.

## THE COMMITTEE FOR STATUTORY REGULATIONS: REPORT

This Committee with power to co-opt deals mainly with amendments to the MOS Act and in the period under review the draft electrical machinery regulations were published for comment in the Government Gazette of 30 May 1986 under notice 378 of 1986.

All comments were discussed at a meeting held on 4 February 1987 in the offices of the City Electrical Engineer, Johannesburg, under the Chairmanship of the former Chief Inspector of Factories, Mr A A Weich, who was retained by the Department of Manpower to complete the updating of the existing machinery regulations.

The main point of concern to Suppliers was resolved by the revision of regulation C61(1)(a)(ii) where metallic roofs, downpipes and waste pipes need not be earthed where supply is derived by means of an underground cable as well as the provision of notices for mini-sub and similar equipment in terms of regulation C52.

The other point of concern was the interpretation of the revised instruction No. OS/BV0099/1 of the Chief Inspector of regulation C56(1) - Protective devices for low voltage overhead power lines - on existing overhead power lines.

The instruction however makes it clear that the methods approved most certainly does not mean that ALL existing low voltage power lines must now retrospectively be provided with suitable earth bars, bows, catchnets and the like regardless of any financial, practical or technical considerations.

What is expected of Suppliers is to achieve compliance with acceptable approved methods on existing power lines where this may be necessary based on the AMEU/ESCOM Guidelines on a systematic planned basis keeping in mind compliance with reasonableness as clearly set out in the instruction. It will always remain the duty of a Supplier to maintain a safe electrical distribution system apart from any instruction and the whole idea behind the instruction is merely to achieve some measure of uniformity based on the AMEU/ESCOM Guidelines as requested

by the Chief Inspector, who most certainly will be able to clarify any misconceptions at the Convention.

The draft general machinery regulations were published for comment in the Government Gazette No. 9366 of 10 August 1984 and as a result of controversial comments on amended regulation C1 the Minister of Manpower established a technical committee in terms of Section 8 of the Machinery and Occupational Safety Act as published by Government Notice 10282 of 10 June 1986 under notice 432 of 1986 with the following instruction -

to inquire into, and make recommendations in regard to the necessity or not, of prescription in the regulations under the Machinery and Occupational Safety Act, 1983, to make provision for supervision over the maintenance and operation of machinery by a specified category of persons, with particular reference to the qualifications, if any, which such persons should hold and the responsibilities with which such persons should be vested.

The members of the technical committee are:

Gerhardus Cornelius Kachelhoffer, Professor, B.A., B.Com., LL.B. and LL.D.; Professor in Commercial Law, University of South Africa, Chairman;

Julius Karl von Ahlfen, Pr. Eng., B.Sc. Eng., Certificate of Competency, City Electrical Engineer, Springs;  
Abraham Burger Jacobus Tindholm, Pr. Eng., Certificate of Competency, Responsible Person, Rand Water Board, Vereeniging;

Neil Stannard, Pr. Eng., B.Sc., Certificate of Competency, Technical Service, Baldwins Steel (Pty.) Ltd., Brakpan;

Edward Dalton, Pr. Eng., Certificate of Competency, Responsible Person, Goldfield Cementation Mining (Pty.) Ltd., Southdale.

This Committee is in the final stages of formulating its recommendations to the Advisory Council for Occupational Safety and as it is premature to make these findings known at this stage a verbal report may be possible at the Convention once the Advisory Committee has either accepted or rejected the Technical Committees recommendations.

J K VON AHLFEN  
Convenor

## MR JK VON AHLFEN: SPRINGS

Mnr die President, daar heers blykbaar 'n verwarring met die toepassing van Regulasie C56(1). Soos u bewys is het die vorige Hoofinspekteur die VMEO en EVKOM gevra of hulle riglyne sou voorberei wat hy kon gebruik in 'n instruksie vir die eenvoudige toepassing van Regulasie C56(1) vir die beveiliging van laagspanningslyne. Mnr Botes was ook op die komitee. Ons het uiteindelik die riglyne aan die vorige Hoofinspekteur voorgelê en hy het toe 'n instruksie uitgereik na aanleiding van die riglyne. Sedert sy aftrede het ons probleme ondervind met sekere bepalings van die instruksie en toe het ons met die nuwe Hoofinspekteur, mnr Manie Mulder, oorleg gepleeg, ek dink u sal onthou, dit was mnr Louber, myself en mnr Botes. Ons het met hom gesels oor die riglyne en die onduidelikhede van die instruksie en hy was toe heeltemal bereid om sy instruksie te wysig en die hele kwessie van redelikhede en wat as redelik beskou

word vir die beveiliging van laagspanningslyne in te bou. Die gewysigde instruksie is toe in Oktober 1986 uitgereik as nommer BV 0099/1 maar soos ek dit verstaan, is die instruksie nog nie amptelik deur die Streekskantore van die Departement van Mannekrag uitgereik aan al die voorsiensers. Ek dink daar was 'n bietjie van 'n verwarring. Die Departement was onder die indruk dat ons as VMEO die riglyne sou uitgee, maar dit was nie die gedagte nie. Ek dink dit is miskien die aangewese tyd om miskien mnr Mulder of mnr Andre du Plessis te vra om net kortliks te verduidelik, angesien daar steeds verwarring heers oor die toepassing van regulasie C56. Die ander punt wat ek graag wil byvoeg is dat soos u weet was daar 'n tegniese komitee aangestel kragtens Artikel 8 van die Wet om te kyk na die wysiging van Regulasie C1. Ek was op die komitee en het ons 'n verslag uitgebring en dit is verwyd na die Adviesraad van Beveiligings, waarvan mnr Mulder die Voorzitter is. Ek is seker hy wil ook graag miskien net ook iets sê wat die aanstelling

van verantwoordelike persone betref.

**MR MANIE MULDER: CHIEF INSPECTOR,  
DEPARTMENT OF MANPOWER**

Mr President, thank you also for inviting me to attend this Convention. I must say, Mr. President, I've been pleasantly surprised by the esprit de corps amongst your members and also the pleasant atmosphere that permeates all of your proceedings. Mr President, as the Americans would say, "I'm the new kid on the block." Fortunately I have the advantage of standing on the shoulders of a great man, my predecessor, Mr Gus Weich.

Mnr President, met u toestemming wil ek graag my kollega, mnr Andre du Plessis vra om dan net oor die beveiliging van kraglyne met u eerste te gesels.

**PRESIDENT:**

Laat my toe om ons gelukwense aan u oor te dra met u aanstelling as Hoofinspekteur: Beroepsveiligheid. Baie geluk.

**MR ANDRE DU PLESSIS: DEPARTMENT OF MANPOWER**

Mnr President, dames en here, ek sien mnr von Ahlften se verslag het gegaan oor statutêre regulasies en by het net twee probleme aangehaal naamlik Regulasie C56 en dan Regulasie C1 wat eintlik nie 'n probleem is nie maar nog so 'n bietjie in die duister is as gevolg van 'n wysiging wat daar gaan plaasvind, moontlike wysigings. So dit lyk vir my asof die VME0 en sy lede nie eintlik probleme het met die Wet en Regulasies nie aangesien hier nou nie baie probleme uitgeklimmer het nie maar ek wil net graag vir u 'n bietjie toelig oor Regulasie C56 want ek self het al baie navrae ondervind ook by u Takvergaderings, veral by die Hoëveldtak. Nou eerstens wil ek graag verwys na die verslag van mnr Botes gister wat gegaan het oor die elektrisiteitsvoeringskomitee, veral Paragraaf 3(d) wat gaan oor probleme met die eerste instruksie. Na die uitreiking van die eerste instruksie in Julie 1986, nadat die VME0 en EVKOM gesamentlike riglyne voorgelê het, het 'n gewysigde instruksie van die Departement uitgegaan wat skynbaar nog nie aan almal bekend is nie. Nou, belangrike aspekte wat ons in gedagte moet hou is, dit gaan hier maar basies om veiligheid en die instruksie is na verdere samespreking, soos wat mnr von Ahlften genoem het, verander om meer aanvaarbaar te wees of in 'n meer werkbare vorm te wees en ons moet hier kyk na wat ons in gedagte moet hou. Kom ons kyk eers wat sê Regulasie C56.

It stipulates, inter alia, that the user shall cause every power line to be provided with protective devices which shall, as far as practicable, and these are the words that I used in this Regulation in the Act, be capable of automatically isolating the power supply in the event of a fault developing in the power line and be so arranged as to ensure the maximum safety of persons.

Dit is 'n regulasie wat nie sommer net ingekom het nie of 'n instruksie wat nou iets vreemds was nie, dit is 'n bestaande regulasie wat vir baie jare al op die Wetboek is. Die instruksie het basies gekom omdat probleme aanhou groei het. U weet, ons ondersoek voorvalle wat plaasgevind het waar kraglyne gebreek het en mense by betrokke was en gedood of beseer is. Nou wil ek verder graag aanhaal uit u eie nuusbrief wat nou onlangs vrygestel is, September 1987 Nr. 3 en ek wil graag na bladsy 5 verwys "Brakpan beveilig lyne" en daar wil ek die volgende noem.

Dit is 'n aanhaling uit u tydskrif. "Waar algemene probleme voorgekom het met kragdraad wat lewendig op die grond beland en gevaar vir die publiek inhou is die erkenning genoeg dat daar wel probleme is." Dit is 'n erkenning wat in die tydskrif gemaak word dat u probleme het met kraglyne wat lewendig op die grond beland en dit is ook 'n bewys dat u reeds daarvan bewus is dat hierdie wel 'n probleem is. Verder wil ek ook dan aanhaal dat die aardboog die stroombreker met die breek van oorhoofslyne onmiddellik laat uitklink en dit is die ondervinding wat Brakpan gehad het na die aanbring van hierdie beveiligingsmeganismes en daar word verder genoem dat dit tog ook relatief goedkoop is. Nou soos ek gesê het, praat ons uit eie ondervinding. Ons het gesien en ons merk dit nog steeds dat kraglyne breek en mense word beseer of gedood as gevolg van die lewendige lyne op die grond en dit gebeur sonder dat die

oorspronke beveiliging in werking tree en het ons natuurlik 'n bietjie kommer gehad.

In taking note of Paragraph 4 of the revised Instruction OS/BV 0099/1, which Mr von Ahlften referred to as the latest edition, please observe that the Department will apply reasonable standards and there we can look at Paragraph 4 of the Instruction. We also want to point out that, complying with the provisions of the Instruction, however, the following shall be achieved:-

A systematic planned basis in respect of powerlines.

The following criteria must be looked at. These are criteria which indicate where attention should be given. Which lines should be attended to first.

- (a) Lines which are situated in densely populated urban areas.
- (b) Lines which are subject to adverse weather conditions.
- (c) Lines which are old.
- (d) Lines consisting of solid conductors.

All four of these criteria must be there. Problems and high risk areas, especially those which have a history of fallen or broken conductors shall first be identified and attended to.

Dames en here, met ander woorde, ons wil nie graag vir u sê en ons het dit ook sekerlik nie gedoen nie dat u ongeag die implikasies alle laagspanning-oorhoofske kraglyne met hierdie aardbeskerming nou onmiddellik moet beveilig. Dit is nodig om beveiliging aan te bring maar dan moet daar 'n maatstaf aangewend word om te bepaal waar gaan u dit doen en u kan vir ons 'n program van aksie voorleë om 'n aanduiding te gee van hoe u dit gaan doen en wanneer u dit, min of meer, gaan doen. Ek kan miskien die vraag vra, "Waarom doen sekere voorsieners dan nou al reeds stappe om aan hierdie vereiste te voldoen?" Is dit omdat daar 'n gevaar situasie is, is dit omdat daar 'n regulasie is wat dit vra, is dit omdat die instruksie nou uitgereik is, waarom wag ons dan? Totdat die Inspektoraat vra dat iets gedoen moet word, voor ons iets doen? Ek wil graag verwys na wat Raadslid Van der Merwe van Alberton gister in sy referaat oor arbeidsverhouding gesê het, en dit is 'n soortgelyke situasie wat ons nou na kyk. Hy het genoem dat daar drie partye deel aan die aksie, te wete die werkgewers, die werknemers en die Staat, en dit is die filosofie van die Wet. Baie klem word gelê op selfregulering. Daarom die samesprekings in die opstel van riglyne en instruksies. Ek wil ook vir Raadslid Van der Merwe aanhaal en dit het Dr Nico Botha ook beaam, daar moet pro-aktief opgetree word en daarom is natuurlik die riglyne daargestel. So, dames en here, vir al die here wat betrokke is by kraginstallasies en beveiliging daarvan, dit is waaroor die instruksie in kort gaan, is redelikheid, en redelikheid word in die instruksie ook taamlik breedvoerig omskryf. So, u sien, ons was nie van mening dat alle kraglyne onmiddellik van hierdie stelsels voorsien moet word nie. Ons vra dat u slegs beveiliging aanbring en gaan pas 'n maatstaf toe om te bepaal waar is onveilige toestande wat eerste aandag moet geniet.

Baie dankie.

**MR DH FRASER: DURBAN**

Mr President, I think first of all we should express our thanks to Mr Mulder and Mr du Plessis for giving us this clarification of the attitude of the Department of Manpower in the application of the legislation which so vitally affects us and particularly the Regulation C56 relating to the protection of low voltage overhead lines. Now, I think if I interpreted Mr du Plessis correctly, in regard to the four conditions which are referred to in Paragraph 5.1.1 of the Chief Inspector's Instruction OS/BV 0099/1, he made particular mention of the word "and" which precedes (d) of that section, so that it would read (a), (b), (c) and consist of solid conductor and he said that all four of these conditions would have to be present, so as far as compliance with the instruction is concerned. I would think what was being said was that we needed to deal with low voltage overhead lines, constructed of solid conductors and in fact, that was my original interpretation of this instruction when it was passed to me by the local office of the Department of Manpower and I wrote to the Department on 9 February of this year just for clarification on that point and I received a reply dated 16 February which, is in



fact, at variance with what has been said here today. So I presume that what has been said would supercede this particular response but perhaps I should just read it so that mr du Plessis is aware of what I'm saying.

The reply includes this section:

"All new construction must comply with the methods as described in paragraphs 3 and 5.2 of the OS/BV 0099/1.

All existing bare copper overhead mains in the priority as listed in paragraph 5.1.1(a), (b), (c) and (d), or any combination thereof, must be attended to by removing the potential threat on a planned systematic basis while keeping the contents of paragraph 5.1.2 in mind."

And then it goes on to say "With a reticulation area as large as that of the City of Durban, it is recognised that total compliance will take considerable time to achieve.

You are therefore requested to submit an overall plan of how you propose to achieve compliance with Regulation C56(1) and the expected duration of the project."

Now I think mr du Plessis also mentioned that the cost of these devices, similar to those that were shown in the AMEU Newsletter was moderate but our preliminary cost estimates, using a device which in fact is simpler than the one shown here, for dealing with all the lines in the Durban area, we estimated approximately R7 million. So that I wouldn't regard this as a moderate cost. Now it is also interesting in this context to refer to some information which mr von Ahlfen made available at the Highveld Branch meeting on 31 July this year and this was Accident Statistics. I'm not sure where he got these but I think he got them from the Workman's Compensation Commissioner Report. And what was said there in the minutes of the meeting was that 15% of all accidents related to machinery, 1.7% of the 15% relates to electricity, 0,07% of the 1,7% result from broken overhead lines. So if we take the total accidents as say R1 million, the number relating to machinery would be R150 000, those electricity related accidents would be R2 550 and accidents from broken overhead lines R1 785 out of R1 million. So, mr President, I would be grateful to have clarification or confirmation of the interpretation of that instruction and that in fact as far as compliance is concerned, if we first deal with solid conductor low voltage lines that that is what is expected. Thank you.

#### **MNR JA LOUBSER: BENONI**

Mnr President, ek wil net een ding regstel. Ek het al voorheen gepraat oor hierdie onderwerp en netnou word ek deur mnr Mulder en mnr du Plessis dalk as 'n heethoof oor hierdie onderwerp beskou, maar dit is ek werklik nie. Ek het net 'n probleem met 'n instruksie wat die Afdelingsinspekteurs uitgereik het wat 'n baie regiede instruksie was waarin daar gestaan het dat ons moet seker maak dat die krag afskakel as daar 'n draad breek en daar is van elk van ons verwag om 'n program voor te lê waarvolgens ons sodanige beskermingstoerusting sal aanbring. Nou, ek kan vir u sê, omdat dit 'n instruksie wat het ek daaraan voldoen. Ek het 'n brief geskryf en ek sit iets soos R80 000 of nog meer elke jaar op die begroting om hierdie nodige beskerming aan te bring. Maar nou moet ek vir u sê terwyl ek nog President was het die Permanente Finansasiesadvieskomitee vir die President van die Instituut van Munisipale Ingenieurs en myself uitgenooi om vir hulle te kom sien in Pretoria en daar is toe aan ons gevra of daar volgens ons opinie enige statutêre verpligting is op plaaslike besture wat ons as te streng beskou. Ek kan vir u sê dat die Munisipale Ingenieurs het die verwydering van fossaat uit riool afval genoem en ek self het hierdie beskerming op bognondse lynne genoem. Ek was gelukkig om onlangs weer in Europa te wees en werklik in Europa en Australië waar hulle houptele het waar dit nog baie meer gevaarlik is, as wat ons hier het, is daar nêrens enige vangboe of addisionele beskerming onderkant die lewendige lynne aangebring. Nou kan ek dit nie begryp hoekom ons dit moet doen. Jy weet, in Europa, is daar sekere dorpies waar die drade eenvoudig met 'n konstruksie bo op elke huis se dak vasgesit is en hulle bestaan so en daar is nie addisionele beskerming vir hierdie lynne nie. Ons het almal afgeveilig hiernatoe en ons het nie vir 'n moontlike noodgeval elkeen

'n valskerm gekry om saam te neem nie. Ek wonder werklik of dit so nodig is. Dankie mnr President.

#### **PRESIDENT:**

Dankie mnr Louber. Ek dink by al die takke is hierdie probleem oor en oor bespreek. Die koste wat aangegaan moet word teenoor die beskerming wat daardeur verkry sal word en tot hoe mate en hoe ver moet 'n mens gaan. 'n Mens wil natuurlik graag op enige gebied beskerming aanbid dat lewens nie in gevaar gestel word nie maar die vraag is seker tot hoe mate, tot hoe ver moet jy gaan om dit te doen? Is daar nog 'n bydrae voordat ons miskien mnr Mulder of mnr du Plessis vra om te antwoord?

#### **MR EG DAVIES: PIETERMARITZBURG**

I'd like to congratulate mr Fraser and I concur with everything he says but there is one point which I think is overlooked. If you are going to put these earth nets, as you call them, on insulated poles, wood poles, you introduce a hazard in that the electrician has to work on these poles alive. He'll now be in the vicinity of earthed metal, he will have to crawl around this somehow or other to get on to the lines and I would guess that we are going to get more than 1,75% fatalities from that source alone. I would just put that point to the speaker.

#### **PRESIDENT**

Thank you mr Davies, I think its 1,875%.

#### **MNR MK MURPHY: SOMERSET-WES**

Mnr die President ek wil net bevestig dat daar tog nêrens die indruk geskep moet word of dat iemand die indruk mak kry dat ons miskien nie gevoelig is of nie omgee dat daar een uit 'n miljoen of hoeveel ongelukke ook al wel gebeur nie. Elke Elektrieseingenieur van elke dorp gee om. Ons wil nie een in 'n miljoen hê nie. Dis net dat ons voel dat party van die maniere waarop die Wet nou toegepas word dalk onredelik kan wees. Baie dankie.

#### **PRESIDENT:**

Dankie mnr Murphy. Mr Fred Daniel of Cape Town.

#### **MR FLU DANIEL: CAPE TOWN**

Mr Chairman, we've all thought about the protection of overhead lines, building nets and things like that to give safety as far as falling lines are concerned but in our modern times we are faced with serious vandalism and I am convinced that by putting up these safety nets we are aiding and abetting vandals to be able to do their thing a lot easier than they can do it now. They've got no worries, they cut down live lines and if we put up easy earthing devices it's going to make their task so much easier and during the unrest period we have had in the Cape, we've lost many overhead lines where they've been cut down and stripped. This I would like to give to you as a thought. Thank you.

#### **PRESIDENT:**

Thank you mr Daniel. Any other contribution? Mr Mulder, there you have a number of thoughts.

#### **MR MANIE MULDER: DEPARTMENT OF MANPOWER**

I would once again call on my colleague, mr Andre du Plessis, who is, unlike myself, an electrical engineer, to answer more of the detail but I would just like to say that the words used in the regulation are "reasonably practicable" and to my mind that most certainly includes costs. The important matter mr President, is that risks should be acceptable. Nobody said the risks should be absent. We are not looking at absolute safety here, we are looking at acceptable risks. With those few words and as regards the details, I hand you again to my colleague, mr du Plessis.

#### **MR A DU PLESSIS: DEPARTMENT OF MANPOWER**

Yes, certainly. I believe it is mentioned in mr von Ahlfen's re-



port and as you have seen he was a member on the Technical Committee. Jules en andere het die saak ondersoek, onder voorsitterskap van Professor Kachelhoffer. Alhoewel die saak nog sub-judice is, wil ek net vir u sê dat daar is basies net twee belangrike veranderinge. Die eerste is dat ons nie meer van 'n verantwoordelike persoon sal praat nie maar eerder van 'n bevoegde persoon — "A competent person." The concept of a responsible person, I think has been done away with, or will be done away with. Die Adviesraad het die Tegniekeraankomende se aanbevelings met een klein geringe wysiging as ek dit reg het, Jules, aanvaar, naamlik dat daar na vier kategorieë van bevoegde persone gekyk word. Die eerste is die ambagsman. Die tweede is die soort tussen die ambagsman, en sal ek maar sê, die ingenieur, 'n tegnolog met, ek dink, die minimum is 'n N5 of T3 kwalifikasie. Elke keer natuurlik met toepaslike praktiese ervaring. Dan die derde en vierde kategorieë sal die gegradueerde en gediplomeerde ingenieur wees, maar indien 'n gegradueerde ingenieur as 'n bevoegde persoon aangestel moet word, of wil word, sal hy eers die Kommissie van Eksaminatore van sy regskennis betreffende beroepsveiligheidswetgewing moet oortuig. Dan ook, mnr die President, is daar spesifiek voorsiening gemaak vir die verhoging van die kragerke waar hierdie onderse kategorieë van bevoegde persone dan 'n verpligte aanstelling word. Die kragerke het ek nou nie so op die punte van my vingers nie, ek meen dit is tussen driehonderd tien-duisend kVA vir 'n tegnikus en dan bo tienduizend kVA 'n ingenieur of dan kategorie 3 of 4 as 'n bevoegde persoon. Dan is daar ook pertinent op voorstel van die komitee aanvaar dat groot ondernemings, nou wat groot ondernemings is, is nou nog nie heeltemal duidelik nie maar soos op Engels gesê, "for want of a better word at this stage" kan groot ondernemings spesifiek die Minister versoek om van die bepaalde regulasie om sogenaamde bevoegde persone aan te stel, virgestel word maar dit sal natuurlik onder baie streng beheerde omstandighede oorweeg word.

Menere, wanneer ons kyk na hierdie instruksie dan is dit soos mnr Mulder vir u gesê het, twee kriteria wat baie belangrik is. Dit moet darem uitvoerbaar wees en dit moet darem redelik ook wees wanneer dit van u verwag word. Om die vraag te beantwoord ten opsigte van die vier vereistes of al vier moet geld. Sekerlik, wanneer al vier van die omstandighede bestaan, wanneer al vier die toestande daar is, is so 'n kraglyn nie meer veilig nie. Met ander woorde, wanneer daar baie mense is, wanneer daar normaalweg swak weerstoestande is, dit 'n plek is waar die wind baie sterk waai, en daar baie ou geleiers van soliede koperdraad bestaan en verder 'n geskiedenis het van gebreke geleiers dan sekerlik dink ek sal enige van u reeds besluit het, ongeag enige voorskrifte, dat daar iets aan gedoen moet word. So in die eerste instansie wil ek weer beklemtoon, die selfregulerende aspek te wete dat u moet besluit, u moet bewys lewer dat u redelike stappe geneem het. U weet daar het 'n kraggeleier gebreke en dat iemand ernstig beheer of gedood is, dan dit uit aan dat daar 'n probleem was en as u kan bewys dat u redelike stappe geneem het om dit te voorkom, dat dit nie 'n opsigtelike gevaarlike situasie voor die tyd was nie, dan het u aangedui dat u reeds genoeg stappe geneem het om te probeer voorkom dat iets gebeur. 'n Verdere punt is die koste aspek. Mnr Mulder het dit aangeraak en dit is een van die aspekte wat weer as 'n redelike stap aanvaar is dat wanneer u 'n beplanning het om in die volgende tien jaar of vyf jaar, of hoeveel jaar ook al, die nodige stappe neem, wat u bedrag geld gaan kos, wat 'n redelike bedrag is, dan is dit deel van u plan van aksie. Ons moet in gedagte hou dat ons hier praat van 'n klein persentasie mense wat betrokke is by voorvalle waar elektriese kraglyne betrokke is maar dan moet u ook in gedagte hou dat ons praat van baie ernstige voorvalle en in die meerderheid daarvan noodlottig. En dit moet 'n aanvaarbare norm wees dat ons so veel mense maar kan laat sterf, dan kan u dit sekerlik doen, maar ek glo nie daar bestaan so 'n norm nie. U weet die persoon wat 'n skok kry en wat dan van die leer afval, dan gaan die voorval deur as die val, nie die skok nie. So, ons moet darem dit ook in gedagte hou. Die kraglyne moet sekerlik veilig wees en u weet die publiek aanvaar dit as veilig want dit sit daar bo in die lug en slegs wanneer dit op die grond beland word dit gevaarlik en dan ook slegs wanneer daar iemand by betrokke was. Dan eers word dit beskryf as 'n gevaarlike situasie wat geheers het of plaasgevind

het. Wat betref die gevaar wat geskep word vir die persoon wat aan die lyn moet gaan werk, is dit so dat jy die omgewing misken 'n bietjie moeiliker maak. In die eerste instansie die persoon kan nou nie so maklik daarbo kom nie want daar is nou al reeds 'n versperring. Maar u weet, ons praat hier nie soseer van aardmatte nie. Daar is verskeie wyse, aardmatte is maar een daarvan. In sommige gevalle is 'n aardmat die beste oplossing vir beskerming van kraglyne en as ons kyk na waar dit belangrike kommunikasie lyne kruis dan word dit voorgeskryf. As ons kyk na die voorbeeld wat in u tydskrif aangedui is dan is dit iets wat nie noodwendig by die paal moet wees nie, met ander woorde, die persoon wat daar gaan opklim, gaan nie blootgestel word aan hierdie beskermingsmaatreël wat moontlike gevaar vir hom kan inhou nie. Verder moet ons onthou dat wanneer persone aan kraglyne gaan werk wat lewendig is, en blootgestel word aan gevaar dan praat ons hier van bevoegde persone. Ons praat van iemand wat weet wat hy doen of onder toesig werk van iemand wat weet wat hy doen. Ons praat nou nie van sommer enige Jan-Rap wie sy maat uitstuur 'n kraglyn om teen 'n paal op te klim om iets te gaan doen nie. Wat ek dus graag wil beklemtoon is, dat redelikheid moet aan die orde van die dag wees en natuurlik ook uitvoerbaarheid. Die feit dat as al vier die situasies geld dan is dit 'n aanduiding dat dit nie 'n baie gesonde situasie is wat bestaan nie. Dan sal u sekerlik iets aan die saak doen. U weet ons is geneig om bome te sny wat onder die kraglyne staan slegs omdat die regulasie so sê. Maar as die bome deur die geleiers groei en daar is bietjie van 'n storm dan het u probleme met die geleiers wat aannekeer raak en hulle kan breek, dan snoei ons dit nie omdat die regulasie so sê maar omdat dit ons pas. Ons waardeer egter die reaksie wat ons van u kry want dit maak dit vir ons ook weer makliker om in die toekoms te kyk na watter probleme u het. Ons sal graag weer in die toekoms met u Uitvoerende Raad en Komiteede wat op hierdie komitees betrokke is samesprekings wil voer om oplossings te soek. Ek dink ons praat dus hier van 'n instruksie wat in opdrag van die Hoofinspekteur saam met u mense saamgestel is, as ek dit reg het mnr van Ahlften. So u weet dit is nie 'n instruksie wat ons op julle afdwing nie. Ons het gevra wat kan julle aan die hand doen, om so 'n instruksie met redelikheid aanvaarbaar te maak en dit kom dus ook van u kant.

#### PRESIDENT:

Dankie mnr du Plessis. Mnr van Ahlften is u tevrede?

#### MNR JK VON AHLFTEN: SPRINGS

Ja mnr die President. Mnr du Plessis het die saak nou duidelik uiteengesit en ons behoort nie verdere probleme met die instruksie te ondervind nie.

#### PRESIDENT:

Is daar enige verdere vrae? Mnr Loubser en dan mnr Botes.

#### MNR JA LOUBSER: BENONI

Ek wil nie oor hierdie onderwerp praat nie, ek wil oor 'n ander een praat, maar ongelukkig ook 'n regulasie. U sal onthou dat mnr Weich, ek wil nie sê, vir ons belowe het nie, maar hy het aangedui dat die aantal tekens wat op die buitekant van substasies aangebring word, gaan verwyder word of verminder word. Die huidige regulasies lees natuurlik nie so nie, die huidige regulasies sê nou watter tekens jy moet aanbring. Ek wil net vra dat mnr du Plessis en mnr Mulder dit asseblief ingedagte hou wanneer die regulasies herskryf word. Dankie mnr President.

#### MNR PJ BOTES: ROODEPOORT

Mnr die President, ek het ook 'n bietjie van 'n probleem. U weet, wanneer 'n mens praat van instandhouding dan doen ek instandhouding vandat ek aangestel is as Elektrotegniese Ingenieur en kyk na my oorhoofselyne op 'n geordende basis en volgens programme en ek klassifiseer my onderneming en dit is deel van my taak as Elektrotegniese Ingenieur. Ek veronderstel dat my kollegas almal wat hier sit doen dieselfde. Ons is bekommerd oor die aangeleentheid van gevaar maar ons het ook norme, daar is ekonomiese faktore, en ander probleme. In die

geval van Rooiepoort, toe die ongeluk daar plaasgevind het, is dit vir my gesê. "Johannesburg sit nou nette onder die lyn en dwaarsarm. Nou Rooiepoort doen dit nie, met ander woorde, julle is skuldig."

En dit is die probleem. Ek voel ons almal doen ons bes. Ek spandeer baie geld in Rooiepoort en ek daag julle uit om te kom kyk na my netwerk. Die ander punt wat ek net graag wil noem is dat ons word gevaar dat ons 'n program moet opstel wat ons dan aan die Inspekteur moet stuur. Nou dit is seker goed maar kom ons stel dit so dat 'n program is nie vas nie, en verander van tyd tot tyd. Die prioriteite verander in die program. Die program wat gestuur word aan die Inspekteur, word lusseer en dan kyk hulle hoe vorder jy volgens die program in die toekoms. Is dit nie beter nie as ons liewer, wanneer 'n ongeluk plaasvind, en daar kom 'n ondersoek, om te verduidelik wat jy gedoen het, en hoe jy dit gedoen het in plaas van om 'n program vooraf voor te lê en te sê ek gaan volgens die program werk en binne 'n paar maande besluit jy om ander belangrike sake aan te pak wat meer veiligheid en aandag vereis. Dankie mnr President.

#### PRESIDENT:

Dankie mnr Botes. Dit is nog gedagtes wat mnr Mulder en mnr du Plessis saam met hulle kan neem om te oorweeg.

#### MR SIMPSON: DESPATCH

I'd like to know from the Department what they consider would be a reasonable time for completion of a programme in accordance with this regulation - 10, 20, 30, 40 years? How many years?

#### MNR MULDER: HOOFINSPEKTEUR

Mnr President, miskien moet ons een vir een vat, eerstens wat betref die baie kennisgewings en tekens. Soos mnr van Ahlfen in sy verslag meld is daar 'n nuwe stel konsegregulasies, dit is die konsep elektriese masjinerie regulasies, "Draft Electrical Machinery Regulations." Hy verwys daarna in die eerste paragraaf van sy verslag. Vir mnr Loubser wil ek net sê die Regulasies is naby aan finalisering en sal hierdie jaar seker nog op die Wetboek verskyn en ek dink daarin sal u sien dat ons baie minder of dat ons hulle wel heelwat verminder het. Trouens, mnr Weich het voor sy dood nog aan die stel regulasies gewerk. Hy het hulle geskryf en ek kan vir u verseker hy het dit daarin vervaar. Verder het ons ook die administratiewe regulasies onder die Wet gewysig waarin voorsiening gemaak word vir die wettiging van simboliese kentekens. Die S. A. Buro van Standaarde het 'n gebruikskode opgestel vir simboliese kentekens so u kan hulle gebruik, hulle is heeltemal wettig. Ten opsigte van mnr Botes se opmerking wil ek sê dat die bedoeling van die instruksie was sekerlik nie om 'n vinger na enige iemand te wys en vir u te sê dat u ooit onredelik was of nie besorg was of nie professioneel

opgetree het nie, hoegenaamd nie. Die bedoeling met die instruksie is ter uitvoering van die Departement se parlementêre opdrag in Wetgewing om na die veiligheid van alle masjinerie en veral die veiligheid van die publiek om te sien. Dit is ons werk, ons moet dit doen en die bedoeling daarmee is nie om die vinger na enige iemand te wys nie. Wat betref die laaste vraag, wat 'n redelike tyd is, mnr die President, u het miskien nou baie tyd aan hierdie onderwerp spandeer so ek gaan nie vir u die hele paragraaf 4 van die Regulasie lees nie maar u kan dit sekerlik ter insae kry en ek wil vir u sê dat u moet daarna kyk. Die opskrif is "Compliance and Reasonableness." Hoe lank 'n bepaalde projek sal neem om al die risikos in 'n bepaalde verspreidingsstelsel binne die perke van redelikheid te kry is sekerlik nie iets wat ek binne vyf jaar of vyftig of 'n honderd jaar kan voorskryf nie. Dit hang van die omstandighede van elke geval af. Dit is uit en uit die toets dat u self moet gaan bepaal of sekere gebrede vandag nog moet aandag kry of ten minste binne die volgende paar dae. Ander sake kan natuurlik op 'n geprogrammeerde en beplande basis gedoen word en as dit vyftig of 'n honderd jaar neem nou ja goed, dan minstens het u van u kant af redelik opgetree. U het die probleem geïdentifiseer, en u het 'n program daar gestel waarvolgens u werk. Met ander woorde, u het redelik opgetree en weereens wil ek beklemtoon dat dit die kern van die saak is en soos ons Amerikaanse vriende sê, dit is "the bottom line", mnr President. Dankie.

#### PRESIDENT:

Dankie mnr Mulder. Mr Simpson, do you think that answers your query?

#### RAADSLID HERBST: VANDERBIJLPARK

Ek wil nie graag enige vrae of enige informasie hê nie. Ek wil net graag die laaste spreker wees op hierdie punt. Is dit in orde so? Mnr die President, na aanleiding van die heersende ramp-toestande wat op hierdie oomblik in Natal en die omgewing heers, en ook na aanleiding van hierdie bespreking oor beveliging van oorhoofse kraglyne moet ek glo dat op hierdie oomblik 'n haglike toestand in Natal heers en wil ek graag die volgende mosie indien:--

Hiermee wil ek voorstel dat die VMEQ 'n mosie van meegevoel betuig teenoor die inwoners van Natal met die haglike omstandighede en skade wat hulle tans ervaar en ook met ons Natalse afgewardegdes wat in hierdie vergadering teenwoordig is en dan voel ek ook dat ons 'n telegram aan die Administrateur van Natal sal stuur. Kan ek net 'n sekondant dan kry vir my mosie asseblief? Dankie.

#### PRESIDENT:

Goed dankie. Dit lyk na 'n goeie en 'n mooi voorstel en kan ek asseblief iemand kry wat die mosie sal sekondeer? Raadslid Muller van Durban. Goed, ek dink dit is 'n mooi gebaar.

## ELEKTRISITEITSVOORSIENING SUBKOMITEE: VERSLAG

1. Mnr Palser was as sameroeper aangestel, maar hy het in 1986 besluit om met pensioen af te tree. Die Uitvoerende Raad het toe vir my aangestel om as sameroeper op te tree. Mnr M P P Clarke het die sekretariële werk verrig waarvoor die komitee hom baie dank verskuldig is, aangesien sy werk en reëlings paik was.

Drie vergaderings is in die twee jare ghou, een te Randburg op 4 Februarie 1986, een te Kaapstad op 5 Augustus 1986 onder leiding van mnr Palser en een in Kempton Park op 4 Februarie 1987.

2. Die volgende aspekte is deur die komitee behandel en elkeen sal afsonderlik in die verslag aangespreek word.

#### (a) SATEKG

- (b) Reserwe transformatorlyns
- (c) Veiligheidsplakkate
- (d) Laagspanning oorhoofse lyne
- (e) Wysigingswet op Elektrisiteit
- (f) EVKOM-tarifverhogings
- (g) Kragbemarkingstrategie
- (h) Kredietkaartmeters
- (i) Cogmanskloof - elektrisiteitsvoorsiening

#### 3. VERSLAG

##### (a) SATEKG

Dié komitee is op 4 Februarie 1986 toegesprek deur mnr Conradie, Voorsitter van SATEKG (Krag) en mnr Marloth en sekere misverstande is uit die weg geruim.

In 1986 is die derde Primêre Voorkeurverbruikerslys opgestel en goedgekeur. Alle verbruikers op die lys is van hulle toekennings in kennis gestel.

Die vierde lys sal nou in 1988 opgestel word. Elk van die

12 streke sal sy eie noodkragplan opstel voor die einde van 1987. Versoek is gerig dat munisipaliteite moet meedoen aan die SATEKG (krag) oefeninge of om alternatiewelik hulle eie oefeninge te doen.

Riglyne vir die toewysing van beperkte hoeveelhede elektriese krag wat beskikbaar maak wees vir verspreiding nadat die Primêre Voorkeurverbruikers voorsien is, is opgestel en deur die VMEGO goedgekeur, met die opmerking dat toekennings sal geskied volgens die verstes tydens die noodsituasie. Hierdie riglyne moet nog deur die Hoofkomitee goedgekeur word.

**(b) Die Reserwe Transformatorlys**

Hierdie lys is laas in 1985 gewerk en 'n beroep word op lede gedoen om my in kennis te stel van bykomende transformators groter as 5MVA wat geïnstalleer is sedert 1985.

**(c) Veiligheidsplakkate**

Veiligheidsplakkate, video's en inligtingstukke oor die veilige gebruik van elektrisiteit is opgestel deur Evkom. Kopieë was beskikbaar gestel by die VMEGO Tegniese Vergadering te Port Elizabeth. Enige onderneming kan direk met EVKOM skakel om van die stukke of plakate te bekom. Dit kan met die embleem van die onderneming in plaas van EVKOM se embleem verkry word.

**(d) Laagspanning oorhoofse lyne**

Riglyne vir die oprigting en instandhouding van laagspanning oorhoofse lyne is deur die VMEGO en EVKOM goedgekeur, maar die Departement van Mannekrag het 'n konsepriglyn wat verskil van die goedgekeurde riglyn aanvaar. Die saak is aanhangig gemaak by die Direkteur van Mannekrag en by het onderneem om by die konvensie sy interpretasie van die aangeleentheid te gee, eerder as by die onderskeie takke sodat eenvormige opinies verkry kan word.

**(e) Konsep Elektrisiteitswetsontwerp en ESKOM-wetsontwerp**

Die konsepwetgewings was aan alle lede van die Elektrisiteitsvoorsieningskomitee voorgelê en geen verdere kommentaar is verkry nie. Hierdie wette dien nou voor die Parlement en sal hopelik tydens die konvensie reeds in werking wees. Die jongste wysiging aan die konsepwetgewing wat in oorleg met die Stadsraad van Pretoria gedoen was, het te make met die voorsieningsgebiede van Streeksdiensterade om saam te val met die voorsieningsgebiede van die betrokke munisipaliteite in sy streek. Waar 'n munisipaliteit dus die reg op voorsiening bekom, het die betrokke Streeksdiensteraad ook die reg maar kan nie buite hierdie gebiede voorsieningsregte bekom nie.

**(f) EVKOM-tarifverhogings**

In 1985 het die Uitvoerende Raad van die VMEGO sy kommer uitgespreek oor die tarifverhogings van EVKOM. As gevolg van die vertoë het EVKOM en ek al die takke van die VMEGO besoek waar EVKOM voorleggings gedoen het.

Voorstaan sal daar net een verhoging per jaar gedoen word en wel met ingang van Januarie van elke jaar. Daar sal gepoog word om die verhogings onder die inflasiekoers te hou en in Januarie 1987 was die verhoging 12%. Dit word in die vooruitsig gestel dat die onmiddellike toekomstige verhogings in die orde van 10% sal wees. Ten minste drie maande kennis sal gegee word voor die verhoging.

**(g) Kragbemarkingstrategie**

Mr Fortmann as ons Aangewese President en ekself was uitgenooi om 'n bemarkingskonferensie by te woon wat op 9 Junie 1987 by die EVKOM Kollege te Halfweghuis vir EVKOM se senior bestuur aangebied was. Die vergadering is toegesprek deur senior EVKOM amptenare en drie besoekers uit die VK, nl mnr Brian Booth, John Williams en Ken Wingfield, asmede deur navorsingsinstansies in RSA.

Die Kragbemarkingsmissie is om die kostedoeltreffende gebruik van elektrisiteit in Suidelike Afrika te bevorder ten einde verbruikersbehoefes te bevredig. Die doelwitte is: (1) die doeltreffende gebruik van energie; (2) vermindering van kapitaalverstees aan die ekonomie; (3) optimale benutting; (4) om die groei van die elektrisiteitsverkoopprys onder die perk van die inflasiekoers te hou. Hierdie doelwitte moet in noue samewerking met verbruikers bereik word.

Navorsing sal gedoen word aangaande verbruikersbehoefes, -houdings en -persepsies. EVKOM sal 'n professionele bemarkingsorganisasie vir homself ontwikkel. Die doel is verder om tariewe en voorsieningsvoorwaardes te ontwikkel wat EVKOM se inkomstebehoefes sowel as die verbruiker as behoeftes aan groter beheer oor sy elektrisiteitskoste sal bevredig, asmede om 'n wye verskeidenheid inligting beskikbaar te stel deur verbruikersadviesdienste en inligtingsentra. Verder sal daar pro-aktief met munisipale en ander verbruikergroepe geskakel word om die oorkoepelende bemarkingstrategie te bevorder en te steun.

Die drie buitelandse besoekers het uiters interessante toesprake gehou aangaande verwikkelinge in die VK sedert die opstel van Kragbemarkingstrategieë deur nutsmaatskappye en die vestiging van bemarkingsbestuurkonsultante.

'n Verslag is verder ontvang aangaande die swart mark, waar advies oor die korrekte, veilige en ekonomiese gebruik van huishoudelike apparate dringend noodsaaklik is. Probleme rakende die herstel van verwarmers, stowe, ketels en strykysters is frustrerend sowel as duur vir die swart gemeenskap. Die klage is geopper dat gedurende hulle spitsperiode tussen 18h00 en 21h00 onderbrekings voorkom en herstelskakeelaars in die strate agter slot en grendel is. Meterlesings is onakuraat en klages gerig aan die plaaslike besture lei slegs tot frustrasies, soveelso dat die gevoel ontstaan het dat 'n deskundige soos EVKOM die kragvoorsiening moet oorneem. Die "budget meter" konsep is met gemengde gevoelens ontvang en behoort opsioneel te wees.

Die voorafgaande behoort dit duidelik te maak dat plaaslike besture as voorsieningsondernemings ook nou betrokke sal wees in die Kragbemarkingsmissie en die Elektrisiteitsvoorsieningskomitee sal hierdie saak verder voer en vroegtijdig verslag doen aan die Uitvoerende Raad.

**(h) Kredietkaartmeters**

Die Minister van Ekonomiese Sake en Tegnologie het 'n komitee in werking gestel wat die moontlikheid van die plaaslike vervaardiging en gebruik van kredietkaartmeters moet ondersoek. EVKOM is belas met die nodige tegniese toetsing van beskikbare meters. Sekere vervaardigers het reeds eenhede gedemonstreer, maar daar is blykbaar net een wat deur EVKOM getoets word op die mark. Die VMEGO, by monde van die Elektrisiteitsvoorsieningskomitee, sal saamwerk met EVKOM en enige verwikkelinge sal onmiddellik aan u bekend gestel word.

**(i) Cognanskloof**

Die Cognanskloof-besproeiingsraad het tot die Minister van Ekonomiese Sake en Tegnologie vertoë gerig om verligting te verskaf ten opsigte van hul elektrisiteitskoste. Die Besproeiingsraad het nege voorsieningspunte, waarvan twee regstreek deur EVKOM voorsien word en sewe deur die munisipaliteite van Ashton, Montagu en Robertson. Die munisipale tariewe is blykbaar tot 40% hoër as dié van EVKOM. Verskeie klein munisipaliteite het betreklik groot vergunningsgebiede en boere in sommige van die vergunningsgebiede het die Minister ook gevra dat EVKOM hulle toevoer moet oorneem. EVKOM was nie bereid om hierdie netwerke oor te neem nie en het onderhandel met die betrokke munisipaliteite om hulle te ver-

goed vir die verskil in koste tussen energieverbruik volgens EVKOM se tarief en die munisipale tarief.

Die VMEO en ander lede van die Elektriesiteitsraad wat industrieë verteenwoordig, het hulle besorgdheid uitgespreek oor die feit dat 'n sekere groep verbruikers, in hierdie geval boere, bevoordeel sal word ten koste van ander klasse verbruikers. Die beginsel is neergelê dat die bykomende uitgawe wat hierdie reëlings vir EVKOM meebring verhaal moet word van boereverbruikers in EVKOM se eie voorsieningsgebied en nie van die ander klasse verbruiker nie. Dit moet gedoen word deur die aanpassing van die betrokke tarief. Dit

sou slegs geld vir bona fide-boere en die SA Landbou-unie moet in oorleg met die Elektriesiteitsbeheerraad en EVKOM besluit watter boere vir hierdie reëling kwalifiseer.

'n Vergadering is belê in Potgietersrus tussen die betrokke partye en ek sou ook teenwoordig wees. Die SA Landbou-unie het egter besluit om die aangeleentheid eers weer in oënskou te neem. Die aangeleentheid, sover dit die Cogmanskloofskeema behels, is reeds in werking gestel. Verdere verwikkelings word afgewag.

P J BOTES  
Saamreoper

#### MNR PJ BOTES: ROODEPOORT

U het my geskrewe gedeeltes, dit is ook in die verslag van die Elektriesiteitsvoorsieningskomitee. Daar is nie veel wat ek daarby kan voeg nie. Ek weet nie of daar enige bespreking is nie.

Gister onder bespreking van die Elektriesiteitswet is die kwessie van Artikel 26 genoem. Ek lees Artikel 26, soos dit in die Wet voorkom:

"In any civil proceedings against another taker arising out of damage or injury caused induction or electrolysis, or in any other matter by means of electricity generated or transmitted by, or leaking from the plant or machinery or any undertaker, such damage or injuries shall be presumed to have been caused by the negligence of the undertaker, unless the contrary is proved."

Ek weet nie of dit dieselfde Artikel is wat mnr Kriek na verwys het nie, maar ek dink dit is baie duidelik uitgespel. Ek weet nie of hy nog probleme met die saak het nie.

#### PRESIDENT

Mnr Kriek het dit so verstaan, maar hy het juis gevra of dit nie onbillik is om so 'n artikel te wettig nie, en toe het mnr Burger ons ook daaroor ingelig.

#### MNR PJ BOTES: ROODEPOORT

Volgens die Artikel is jy skuldig maar gee nou vir jou die kans om die teendeel te bewys, en ek dink dit is net 'n redelike situasie wat hier geskep word. So ek kan nie sien dat daar eintlik probleme is nie. Dit is 'n baie goeie artikel en dit vrywaar ons tot 'n sekere mate.

#### PRESIDENT:

Mnr Botes ek dink mnr Kriek wou dit andersom gehad het, dat jy onskuldig is tot dat jy skuldig bewys word, en hierdie artikel is nou net die teenoorgestelde.

#### MNR PJ BOTES: ROODEPOORT

Nee dit sal hy nie regkry nie. Die posisie is dat die algemene publiek sal ons maar sê, onkundig is wat elektrisiteit betref en moet beskerm word, daarom is jy as kundige persoon beter in staat om jouself onskuldig te bewys as wat hy in staat gaan wees om vir jou te sê dat jy skuldig is. Dit is die hele gedagte hieragter.

#### PRESIDENT:

Dankie mnr Botes. Ook maar goed dat die mense in Strandstraat 'n hele ent hiervandaan ons nie kan hoor nie. Ons gaan ons oor na die volgende item. Is daar enige bespreking oor SATEPSA? Niks nie. Dankie.

## THE ECA/AMEU/ESCOM LIAISON COMMITTEE: REPORT

The Liaison Committee held five meetings in the period under review under the Chairmanship of the President of the ECA.

Matters of common interest to the three organisations were discussed and these can be briefly summarised as follows -

#### 1. MACHINERY AND OCCUPATIONAL SAFETY ACT 1983: ELECTRICAL INSTALLATION REGULATIONS 1985

Agreement has been reached on a standard format of the forms to be used in conjunction with electrical installation regulations as accepted by the Chief Inspector.

The Chief Inspector has however directed that Suppliers may use up their existing forms and implement the new forms as soon as possible thereafter. Specimen copies of the standard forms were made available to all members of the Executive Council including Branch representatives and it is expected that each undertaking will provide their own copies, except Form F37 which is the only official notice issued as an addendum to the regulations.

Agreement has also been reached in consultation with the Chief Inspector on the scope of "repair work" for which no forms will be required which was also made available to all Branch representatives for the information of member undertakings.

The complaint by electrical contractors that certain installation inspectors enforce requirements in excess of the wiring regulations has been brought to the attention of all Suppliers with a request to refrain from such practices which may lead to legal action being instituted against those Suppliers who may have been involved.

It should however be borne in mind that the terms of reference of the Liaison Committee and regional Subcommittees does not include official interpretation of the wiring regulations which must be directed to the SABS Co-ordinating Committee for submission to the Main Committee of the SABS responsible for any amendments to and official interpretation of the meaning of the regulations.

#### 2. GUIDELINES FOR THE ISSUE OF PERMITS

The need for uniform guidelines for the issue of permits has been identified and these were approved in September 1986 by the Executive Council subject to acceptance by the Liaison Committee. The ECA has however referred the AMEU Guidelines to their Technical Committee for scrutiny and at the time of compiling this report no reply had been received in the absence of which the Executive Council at its meeting on 19 March 1987 agreed that the Guidelines contained in draft No. 2 dated 29 July 1986 be circulated to all member undertakings.

A special word of thanks must be directed to Dennis Fraser, City Electrical Engineer, Durban, for compiling the final version of the Guidelines.

#### 3. CERTIFICATE OF REGISTRATION AS ELECTRICAL CONTRACTOR

Regarding the question upon which legal grounds the cer-



tificate of registration could be withdrawn the Chief Inspector has replied that when an electrical contractor is convicted and found guilty of a contravention of the regulations the supplier or plaintiff must direct the attention of the Court to the provisions of section 29(2) of the Act.

The Court will decide on the punishment and may even withdraw or endorse the certificate of registration of the contractor. The Court has to be guided in that direction and the charge should be for the contravention of the regulations read with section 29(2) of the Act.

#### 4. ELECTRICAL CONTRACTING EXAMINING BOARD

The proposed establishment of an Electrical Contracting Examining Board by the ECA was supported in principle but the AMEU considers such a Board to be a purely domestic matter of the ECA to regulate its own affairs. The AMEU may also not accept more stringent requirements for the registration of contractors than those required by legislation as envisaged by the examining board.

#### 5. REGIONAL SUB-COMMITTEES

Representation on the regional sub-committees will be at managerial level pursuant to the problem experienced by the East London Electricity Department in this regard. Official interpretation of the wiring regulations is also not a function of these committees but must be handled in terms of paragraph 2 above.

#### REGULATION 7(2)(b): ELECTRICAL INSTALLATION REGULATIONS

##### MR JK VON AHLFTEN: SPRINGS

I just wish to refer to the guidelines for the issue of permits. The ECA has commented on the proposed guidelines and these will now have to be considered by the Executive on Thursday and after the Executive has considered the comments on the guidelines, I suppose we will have to send them out as a guideline to all suppliers. I know your sentiments as far as the whole question is concerned, but I don't think we should have any discussion on that point, at this point in time.

##### PRESIDENT:

I agree, because we might get a little emotional here.

##### MR JK VON AHLFTEN: SPRINGS

There is nothing else Mr President that I wish to refer to. What is in the report is open for discussion, if there are any questions, I will gladly answer them.

##### DENIS KNEALE: AFFILIATE

Good morning Mr President, Mr President Elect and gentlemen. I would like to thank Mr von Ahlften for the wonderful

In Government Gazette No. 10600 of 6 February 1987 regulation 7(2)(b) has been amended as follows:-

#### SCHEDULE

Amendment of regulation 7(2)(b) of the Regulations published in Government Notice R.2270 of 11 October 1985.

Regulation 7(2)(b) of the regulations is hereby amended:

"employs an installation electrician on a full-time basis or who is himself an installation electrician who is available to do or supervise installation work whilst such work is being done." (6 February 1987)

It is the official interpretation that "supervise" does not mean "continuous personal supervision" but that the installation electrician must be readily available whilst the work is being done. For example an individual installation electrician could not undertake part-time work and then be absent while he is being employed elsewhere on a full-time basis whilst he has workmen actually engaged on the work as he will not be readily available. Alternatively an electrical contractor or his installation electrician could not absent themselves until the work is completed but must be readily available whilst the work is being done.

#### 7. CONCLUSION

As this is my last report before retirement on the activities of this Committee, I wish to thank the other two AMEU members on the Committee, Messrs. Clarke and Heydenrych, for their support over the past two years.

J K VON AHLFTEN  
Reporter

contribution he has made to the work of this committee. Over the past 2 or 3 years he has come up with some very, very good and workable ideas and we've arrived at suitable agreements between all parties. I would also like to thank Eskom for their contribution, that is Mr Ackerman and Mr Haasbroek. When we've held these meetings their contributions to the solutions of problems that we have encountered have been most useful.

Mr President, I think that as far as the Code is concerned we should have a look at then Western Cape and Natal Escom guidelines and I know this was done by a working group about ten days ago. I haven't had time to study their findings but it is a possibility that some of those guidelines could be incorporated in the Green Pages in the Code. This would certainly make the life of the Electrician easier if he knew exactly what they had in mind with regard to a particular regulation in a particular area.

Mr President, I thank you.

##### PRESIDENT:

Thank you Mr Kneale. Those guidelines you referred to, you could possibly ask the Sub-committees concerned if they would share that with other committees to look at, if such a thing is available. Thank you. Any further discussion?

medium for the voluntary co-ordination of various research projects in the electric power field. The AMEU, the State, the universities and industry are represented on the Committee, which meets twice a year.

The Committee appoints members as Convenors in designated fields, to report on achievements, ongoing work and areas which need to be addressed. The Convenors, where appropriate, form working groups to act as advisory panels, made up of experts who are directly involved in the particular field. In 1985 the Committee's activities were restructured into four specialised fields viz. Insulation, Interference, Power Equipment and Insulation Co-ordination. A subcommittee on EHV facilities and one for research co-ordination and publication were also appointed.

In 1986 the Committee discussed its future against the background of the CSIR's rationalisation and recommended that the Committee continue under the chairmanship of Dr J D

## THE HIGH VOLTAGE CO-ORDINATING COMMITTEE: REPORT

This Committee was formed in 1966 at a time when South Africa's electricity supply industry was facing a programme of major growth, which would require the use of ultra-high voltages and state-of-the-art technology. The initiative of the formation of this Committee was taken by the CSIR, who provided the Chairman and also undertook to do the secretarial work.

The Committee's areas of concern and activity have broadened to include several diverse aspects of power and high voltage electrical engineering and it has developed a unique role as a



### 1. High Voltage Insulation (Convenor: Prof J P Reynders)

Despite the depressed economic climate in South Africa, local research in the field of high voltage insulation has continued at a vigorous pace.

Air insulation is enjoying the greatest level of activity at present time, work being focussed largely on the performance of conductors in geometries which are representative of power lines and on altitude and humidity correction factors relevant to the South African situation. The objective of the work is to obtain more precise information on the behaviour of air and so refine transmission line design.

Insulator pollution remains a very severe problem in certain parts of the Republic. Research is being directed to understanding the effects of weather shed design and weather shed material on the pollution performance of insulators. To augment work which is being undertaken in the field, the University of Stellenbosch is actively engaged in a laboratory programme in a salt-fog chamber and NEERI is launching a programme in its newly commissioned clean-fog chamber.

In the field of liquid impregnated insulation, an issue which has come into prominence is that of SF<sub>6</sub> contamination of oil in transformer bushings. Electro-chemical activity caused by partial discharges in SF<sub>6</sub> bubbles in the oil produces very aggressive by-products, which decompose the paper and attach the conductors. Two projects to address these issues are presently in progress.

An investigation into the high shatter rate of insulators on high voltage DC lines is continuing as part of a CIGRE programme. Indications are that the mechanism of failure is associated with high internal stress and ionic currents.

### 2. Interference (Convenor: A C Britten)

The working group in this field has concentrated on two broad activities within the technical scope of corona, power line field effects and quality of supply viz. identification of wide-ranging interference problems of local significance and continued work on the specific topics of electromagnetic interference generated by power lines and harmonics. Various topics under consideration and investigation which may be of particular concern are, radio influence voltages, radio and television interference from power lines, coupling between power and telecommunications systems, harmonics, voltage variations and temporary overvoltages in electrical networks and electric fields generated by power lines and distribution stations. An interesting finding to emerge from the last mentioned investigation is that there is still no positive medical evidence to suggest that short-term or prolonged exposure to power line electric fields causes harmful biological effects in humans.

The working group sees as its major role the preparation of appropriate documentation on interference topics of general significance to the South African power engineering environment and is making progress in this regard.

### 3. Power Equipment (Convenor: A S Meyer)

With the restructuring of the Committee's activities, the rotating machine working group was broadened to the general field of power equipment, so that other relevant topics could be considered. At present the only active working groups are those on rotating machines and variable speed drives.

The fault recording scheme for high voltage motors is still active and work on a proposed workshop on high voltage motors is in progress. Members of the group were actively involved in the preparation of a special issue of *Elektron* de-

voted to high voltage motors. The newly formed working group on variable speed drives is to consider, *inter alia*, the following topics: types of drives, size and voltage of drives, application of drives and energy savings.

### 4. Insulation Co-ordination (Convenor: G R Marshall)

Following the restructuring of the Committee the broader field of Insulation Co-ordination was introduced to take account of the increasing high-voltage research and testing activities that had been facilitated through the establishment of comprehensive high voltage laboratory facilities in the country.

The earliest working group on lightning was incorporated into this new field of convenorship and is now constituted as an informal association of persons having a direct interest in lightning research. The former duties of the group concerning lightning flash density recording have been taken over in a modified form, by the Weather Bureau (Department of Transport). Aspects of particular importance include: (a) formal approval and publication of South African Bureau of Standards Code of Practice 03-1985 (The Protection of Structures against Lightning) (b) formal approval and publication South African Bureau of Standards Code of Practice 0199 (The design and installation of an earth electrode) (c) the preparation of a design code for the insulation co-ordination of overhead distribution lines.

The following local programmes have been discussed by the working group on Insulation Co-ordination and proposals are being formulated:-

- Rating and application of metal oxide lightning arrestors.
- Standardisation of overhead line designs in the medium voltage range.
- Revision of Code of Practice for overhead lines.
- Type testing of locally designed bushings and post insulators to IEC standards.
- Detailed design of insulation system for electrical apparatus.

### 5. EHV Facilities (Convenor: J C van Alphen)

The three major EHV research and test facilities in the Republic viz. the National EHV Research and Test Facility, Apollo, Midrand; the NEERI EHV Research Facility, CSIR, Scientia, Pretoria and the Escom Corona Research and Test Facility, Megawatt Park, Sandton are fully operational and are being utilised.

The building of a new EHV laboratory as part of the development of the South African Bureau of Standards' site at Apollo has been completed and is suitable for testing equipment for system voltages of up to 765 kV. Visible corona and discharge phenomena can be observed in complete darkness from various positions within the laboratory. Special attention was paid to the earthing and screening of the building in order to achieve a low radio-interference background level.

### 6. Publication Co-ordination (Convenor: E F Raynham)

Considerable interest has been shown in publications of the Committee's activities, including progress reports for the years 1982 to 1986 (reference HVCC1, HVCC3, HVCC4, HVCC5, HVCC8) and "recommendations on inbalanced voltage limits" (Reference HVCC2). Other technical publications relating to the temperature rise of induction motors and the application of surge suppressors to motors are nearing completion.

Publications are available from NEERI, P O Box 395, Pretoria.

## DR NAUDE VAN WYK: WNNR

Mnr die President, eerstens laat my toe om namens die WNNR u geluk te wens met u nuwe amp, en ons wens vir u baie voorspoed en sterkte toe vir die twee jaar. Ons het natuurlik hoë waardering vir die nou skakeling wat ons met die YMEO het en ons leer baie daaruit en ons hoop om dit in die toekoms voort te sit.

Wat die Hoogspannings Koördinerings Komitee aanbetref, is mnr Leigh se verslag taamlik uitgebrei. U sal sien daaruit dat dit 'n baie aktiewe komitee is. Daar is vyf werkgroepe wat aandag gee aan spesiale onderwerpe en daar is ook 'n sub-komitee wat sorg dat daar koördinerings plaasvind sodat die uitvloeiels van hierdie werkgroepe gepubliseer kan word. Ons het dan ook op die oomblik 'n lys van publikasies beskikbaar. Ek sal dit vir die Sekretariaat gee dan kan u dit miskien laat dupliseer vir die wat belangstig. Daar is nege verslae beskikbaar en daar is tans twee in voorbereiding.

Mr President, then another item which is not referred to by mr Leigh is, that is a result of deliberations in the High Voltage Co-ordinating Committee and also the Power Sub-Committee Advisory Committee of NEERI, a planning committee for high voltage research co-ordination has been formed. This is a very small committee consisting of four people. Myself from the CSIR, mr Dennis Duffield from Escom, mr van Alphen from the Bureau and Professor Reynders representing Universities. Now the idea is that we should not just co-ordinate research but that we should actually plan to do research in a co-ordinated way.

There is a vast amount of information and knowledge available in South Africa within the research community and we are mobilising this, adding to it when necessary, and in particular the main target is the optimisation of high voltage transmission lines and we think a lot can be done as new technology develops and time goes on to make optimisation a reality, which will reduce costs and increase reliability.

I would also just like to refer to a joint project which we have with Eskom, and that is on an 11 kV distribution line where we particularly studied the effect of lightning, and if you will allow my colleague Henry Geldenhuys to just in a few words tell you what the outcome of that was.

Thank you mr President.

## HENRY GELDENHUYS: WNNR

Dit is vir my aangenaam om vir u een en ander terug te rapporteer oor die werk wat die Hoogspannings Koördineringskomitee se Sub-komitee vir die Beskerming van Distribusie-lyne teen Weerlig wat reeds daar gestel is.

## THE WORLD ENERGY CONGRESS: REPORT CANNES (FRANCE) – 5 – 11 OCTOBER 1986

### PREAMBLE:

- 1.1 The 13th Congress of the World Energy Conference was held in Cannes (France) from the 5th to the 11th October 1986.
- 1.2 It was attended by some 4 000 delegates and accompanying persons representing 79 countries from as far afield as Japan, Korea, China, India and other Asian countries to Russia and a number of East European countries, most West European, North and South American, many African and Middle East Countries, Australia, New Zealand, etc.
- 1.3 Delegates covered a wide spectrum of interests and expertise ranging from Engineers, Scientists, Economists and

Enkele jare gelede, ek dink dit was 1981 of dit kan selfs 1983 gewees het, het een van my kollegas Dr Andy Eriksen, 'n referaat aan hierdie organisasie gelewer oor die werk wat daar gedoen word. Hierdie werk het ver gevorder en die aanbevelings wat daaruit spruit is al in omvattende wyse deur Evkom spesifiek op hulle houtpaal distribusie lyne geïmplementeer, en ons glo dat dit werklike die werkverrigting van hierdie lyne aansienlik verbeter. Die voorlopige resultate ondersteun dit ook ten volle. In sommige gevalle, verminder dit self die koste van hierdie lyne en ek dink werklik daar word geslaag om verhoogde betroubaarheid en verlaagde koste daar te stel.

Ongeveer aan die einde van hierdie jaar of begin volgende jaar, sal daar 'n gids beskikbaar wees, saamgestel deur hierdie komitee, waarin die beginsels uitgespel word wat gebruik behoort te word in die onderwerp van distribusie lyne, en ek dink dit kan tot voordeel wees van lede van hierdie organisasie om van hierdie inligting gebruik te maak.

My much appreciated colleague in this committee, Trevor Gaunt, is responsible for the main compilation of this Code. Lastly Mr Chairman and mr President, in any research from a pure research point of view, we can do basic research and come up with certain recommendations. Being researchers we very often find that we are wrong because we don't see the full world. We only see the little world that we concern ourselves with and to eliminate this, there was a request to members of this convention, to actually participate in a reporting scheme which again Trevor Gaunt was responsible for, and we would like to thank the members of this organisation who effectively contributed to this. But I am afraid that I have to say to you that the majority of people did not respond in the way we had hoped for.

Now exactly what we are going to do with this work in the future, has not been decided yet, and I don't know whether Trevor Gaunt wishes to comment on that. But all that I would like to ask you is, that should we in the near future come back to you in writing asking for your support in reporting back to this committee on your experience on specific lines, and that means bad experiences as well as good experiences, because both these actually confirms and condemns certain approaches. We would appreciate your full support in this work because that is the only way in which we will actually come up with recommendations that will really make sense to all of us.

Thank you mr President.

### PRESIDENT:

Thank you Mr Geldenhuys. We also have an offer from the CSIR from NEERI and we thank you for that Dr van Wyk and mr Geldenhuys.

Scientific Journalists to State Officials from various nations as also representatives of various United Nations Organisation Agencies.

- 1.4 South Africa was represented by 20 delegates. These included representatives from ESCOM, various Universities, the Atomic Energy Board and other State Departments and Organisations, the The Association of Municipal Electricity Undertakings of South Africa, and some commercial organisations.

### OPENING:

- 2.1 The official inauguration of the Congress was performed by the President of France Ms Mitterrand who expressed the hope that the nations of the world would find effective ways to regulate the market prices of internationally traded energy commodities so that economic upheavals like that which took place in 1973/74 with the oil price shock – and the problems which followed for most nations – could be avoided. He highlighted the mutual dependence which existed between energy consuming and supplying countries, and the plight of developing countries who are unable to pay for the energy requirements which are essential to their future well-being and development.

- 2.2 In his welcome to delegates and review of the energy scene during the three year period since the last Congress, the President, Mr T R Satish Chandran of India, commented that the most noticeable feature was the sharp decline in oil prices. This has had the effect of slowing down some of the research which has been in progress to find more efficient ways of using all forms of energy. It has also caused investment in research into alternative energy sources to be cut back as also, in oil exploration programmes.

He pointed out that the relatively easy low cost measures to conserve energy had been taken shortly after the first oil crisis and that further measures require increasingly more investment, research and development. And increasing populations resulted in greater demands on energy resources; he advocated vigorous policies in controlling the demand and, augmenting the sources of supply.

#### PROCEEDINGS:

- 3.1 In order to effectively consider the more than 220 papers which had been prepared for the Congress, the proceedings were grouped under four divisions and a number of subdivisions as set out below:

##### I: Trends in the energy sector since 1970 -

- (i) Resources; national and regional balances
- (ii) Changes in consumption patterns by sectors
- (iii) Rational energy use

##### II: Relationships between energy, the economy and the environment

- (i) Interaction between energy choices and socio-economic factors
- (ii) Energy related financial problems
- (iii) Forecasting and planning
- (iv) Energy and the environment

##### III: International relationships and co-operation

- (i) The consequences of development and trends in energy flows and technical exchanges
- (ii) Products exchanged and security of international trade

##### IV: Problems of the short and long term future

- (i) Current developments in technology and future trends
- (ii) Research and development medium term prospects
- (iii) Research and development long term innovations

- 3.2 In addition a variety of working groups, experts' meetings and round table discussions took place which looked at subjects such as oil reserves, coal utilization, the growing role of electricity, natural gas, the future of nuclear power, energy in agriculture, energy in rural households, investment needs, heat pumps, energy information, energy terminology and many others.

- 3.3 The sessions were chaired by eminent authorities in the respective fields, assisted by international panels of experts. Each member of the respective panel presented a summary of the papers covering a particular subject matter whereafter individual contributions and general discussions took place.

- 3.4 Simultaneous translation into three official languages of the Congress namely, French, English and Spanish made it possible for all delegates to follow the proceedings and discussions at all times.

- 3.5 The Congress venue also included about 8 500 sq m of exhibition space which was taken up by 225 commercial and state organisations each demonstrating by way of displays, models and various other techniques, details of their representative products relating to energy exploration, conversion, control, development, and so on.

#### CONCLUSIONS:

Some of the more important findings which came out of the Congress proceedings are summarised below:

- 4.1 Based on proven reserves and projected consumption patterns coal is expected to be the only energy source likely to be relatively freely available in the period 2020 to 2040.

Most other fuels will probably be experiencing some form of shortage or other stress in the supply/demand equation.

- 4.2 Uranium extraction will be near saturation point with supplies in the Northern Hemisphere virtually exhausted.

- 4.3 "Breeder" reactors which initially require plutonium from conventional nuclear "fission" processes before they become self supporting, are not likely to be commercially available in large enough numbers to provide much relief in this period.

- 4.4 The "fusion" process, which is being researched in "MHD" reactors, is still far from being a practical alternative energy source. The technical breakthrough which is necessary to make the process viable has not yet been achieved even though both Russia and America have massive projects in this field.

- 4.5 In spite of the possible "shortage" of uranium in the future, atomic reactors are expected to be used increasingly for the generation of electricity. At present some 14% of the world's electrical energy is provided from atomic power stations and this is expected to increase to 25% in spite of setbacks like the "Chernobyl" and "Three Mile Island" accidents.

- 4.6 Increasing attention is being given to all forms of pollution and environmental problems associated with energy conversion processes whether from for example, radiation contamination, acid rain from the combustion of coal, carbon dioxide and other atmospheric pollutants from burning hydrocarbons, and ecological changes of various types. (CO<sub>2</sub> is increasing by 0.4% per annum in the atmosphere).

- 4.7 Great concern was expressed at the rate of de-forestation which is taking place in developing countries. The problem is aggravated in many cases by the fact that increasing populations are stressing national fuel resources and many of the countries are unable to import alternative fuels because of foreign debt problems. Most countries are trying to develop electricity networks in an effort to improve the energy availability position.

- 4.8 International trade in natural gas has increased during the past 25 years to the point where, in 1984, it represented 10% of the international trade in fossil fuel. The Soviet Union is the world's largest producer of natural gas.

- 4.9 "Renewable" energy sources such as tidal, wave, wind and solar are all being researched but the practical difficulties involved including sites and capital costs prevent these from becoming serious alternatives on any large scale. Photo-voltaic solar is still a long way from the technical breakthrough which must be achieved in the materials field for it to become a major source of energy.

- 4.10 In general, all countries are using less energy per capita than was the case before the oil crisis of 1973/74. However, with more people and more affluence throughout the world total energy consumption is increasing.

- 4.11 As a direct result of the oil crisis and the effect it had on energy consciousness throughout the world, all energy conversion processes have been subjected to on-going critical evaluations of efficiency. Much work is still being done but the necessary technical breakthroughs are becoming increasingly difficult to achieve in all spheres. For example the common refrigeration cycle has a potential to be increased in efficiency by a factor of 10 above its present level, and the average internal combustion engine has only increased in efficiency by about 2% in the last 10 years.

- 4.12 Overall, electricity is continuing to increase as the most practical energy source and technology developments will effectively reduce the "real" price of electricity world wide compared with other commodities.

- 4.13 While some countries have introduced various schemes to encourage energy conservation (eg. government grants or loans for energy conservation schemes, tax relief for research and development projects, etc) as a general observation, not sufficient attention is given to formal policies embracing all aspects of the use of energy, by most countries throughout the world.
- 4.14 Much more emphasis could be placed on public awareness campaigns and education at all levels in the communities of most countries, than is presently the case.

## GENERAL

# ELEKTROLITIESE VERWERINGSKOMITEES: VERSLAG

## 1. HOOFKOMITEE (A J van den Berg)

Die Hoofkomiteevergadering is op 24 September 1986 in die lesingskamer, Rand Waterraad-gebou, Johannesburg, gehou.

Onderstaande is uittreksels uit die notule van hierdie vergadering wat op die VME0 betrekking het:

6.3.2 The Chairman enquired as to the present status of the AMEU Code of Practice on earthing of domestic electrical supplies. Mr Du Plessis advised that he had discussed the matter with Mr Kitching from the SABS who informed him that the SABS had the draft and Appendix E of SABS Code of Practice 0199-1985. Mr Kitching advised that due to lack of funds and of staff no progress had been made. Mr Du Plessis said he will refer the matter to the Executive Council of the AMEU.

## 8.0 CODES OF PRACTICE

8.1 The Chairman tabled the following progress report regarding the SABS Codes of Practice.

### Project No 761/50290: The design and installation of an earth electrode

Progress: Finalized and published as SABS 0199-1985. The contents of both Appendix E and Table E-1 are largely as a result of the contributions made by the S A Electrolytic Corrosion Committee.

### Project No 761/50300: Neutral earthing in medium voltage industrial power systems

Progress: Finalized and published as SABS 0200-1985. Reference is made to Appendix E contained in SABS 0199-1985 regarding corrosive behaviour of certain metals, again the Committee's contribution.

### Project 761/50310: The application of protective multiple earthing to low-voltage distribution systems

Progress: No progress to report.

## 9.0 TECHNICAL BULLETINS

9.1 The Chairman advised that two Technical Bulletins were issued through the year.

**Technical Bulletin No 7:** Electrolysis with particular reference to communication cables - by M C du Plessis, Senior Technician, South African Post Office.

**Technical Bulletin No 8:** Handleiding insake Elektrolitiese Wegvretting - deur C J van Rooy, Elektriese Ingenieur, S A Vervoerdienste.

## 2. WITWATERSRANDSTREEK (A J van den Berg)

Die Streekskomiteevergadering is op 25 September 1986 in

- 5.1 The Congress provided ample opportunity to meet people from all countries of the world. The South African delegates made full use of the contacts to improve person-to-person relationships and were well received at all times.
- 5.2 Gratefull appreciation is recorded for the opportunity which was afforded by the Randburg Town Council and the Association of Municipal Electricity Undertakings of South Africa, whereby attendance at this Congress was made possible.

M P P CLARKE  
Representative

die Konferensiesaal, S A Vervoerdienste, Johannesburg, gehou.

Items wat by hierdie vergadering bespreek is en wat op die VME0 betrekking het, was maar net 'n duplisering van bogenoemde items wat die vorige dag op die Hoofkomiteevergadering behandel is.

## 3. NATAL REGION (E G Davies)

This report covers the activities of the Natal Electrolytic Corrosion Regional Field Committee over the previous four year period.

Attendance at the meetings, which are held six monthly, has been good and consistent, providing continuity and good coverage of all pertinent information and queries.

Of particular note during this period of review are the following:

- Improvements have been instituted in the administrative procedures relating to applications received by SATS regarding encroachments, drainage bonds and test points on installations. This has resulted in time saving as well as more definitive information becoming available to the Committee.
- Information regarding installations with potential influence on the assets of AMEU members in Natal has been forwarded to those AMEU members for their attention and direct liaison with the parties concerned.
- Information about the specification, development and field testing of a microprocessor based recorder has been made available by S A Pipeline Department (affiliated to SATS) to the Committee as well as the Main Committee for the benefit of all parties concerned with Electrolytic Corrosion. The recorder was developed with Electrolytic Corrosion measurements as a primary function but is easily adaptable to any circumstances requiring robust field equipment.
- Information on protection of diodes used in bonds was made available by SAPO and SATS test facility and whilst no firm directive was called for, useful information was made available which provides the basis for lower failure rate installations.

All corrosion problem areas brought to the attention of the Committee were monitored by representative bodies until the situation was either resolved with finality or, as is currently the practice, the installation of remedial equipment is monitored until the Committee is satisfied that the situation is no longer a cause for concern.

Information on equipment mentioned in 3 and 4 above is available from the Committee through the Secretary, NECRFC, Room 2307, 477 Smith Street, Durban, 4001.

The Committee has been successful in achieving its goals and the thanks of the Committee went to the longstanding Chairman, Mr M L Whitehead (SATS) on his retirement in 1986.

## 4. NORTHERN CAPE FIELD COMMITTEE (Dr N S Botha)

The past two years have been relatively quiet in our region other than the normal applications which were received from -



- (a) The Oil Industry Corrosion Control Group for a Si Fe anode at the Mafeking fuel depot.
- (b) The Balkfontein/Wolmaransstad water pipeline near Leuodoringstad (Messrs Michael A Brett & Partners International Incorporated).

We have had the following items of general interest:

**1. Underground service pipeline at the SATS Electric Locomotive Depot**

The service pipes are approximately 30 m long. Cathodic protection of this short line was more costly than replacing it with high-pressure, heavy-duty polythene pipes.

**2. Riverton/Kimberley water pipeline**

The control circuit of the cathodic protection type THT-100, supplied by Cortec, installed to protect the line, was prone to damage by electric storms. The problem was solved when the control voltage source was taken from the A C side of the rectifier as opposed to the D C side.

**3. Vaal/Gamagara water pipeline**

(Total length 450 km, replacement value R70 000,00)

Maintenance of the cathodic protection installations along this pipeline was a major problem because of the length of the pipe as well as the lack of suitable staff. Component failure was also relatively high.

The Department of water Affairs embarked on a R1 000 000,00 upgrading project comprising of:

- (a) duplicating the drainage bonds;
- (b) changing transform rectifiers from constant current to constant voltage sources. This is to eliminate the effect of stray currents on the control system; and
- (c) installing natural drainage bonds in case the forced bonds failed.

**4. Escom, Blankenbergvlei suspected a case of electrolytic corrosion**

This proved to be a case of stray current electrolyses (zinc galvanised pipes and an alkali soil). Pipes were replaced with plastic type.

**5. REPORT OF THE AMEO REPRESENTATIVE ON THE CAPE WESTERN ELECTROLYTIC CORROSION REGIONAL FIELD COMMITTEE (K J Murphy)**

Six meetings of the Committee were held under the chairmanship of Mr R R Gilmour. At the recent AGM meeting Mr J de C Krynauw, SATS Regional Electrical Engineer was elected Chairman and Mr R R Gilmour was elected Vice-Chairman. Mr Gilmour who has been Chairman of the Committee since its inception and who retired from the Cape Town Municipality some years ago, was thanked for the invaluable services he had rendered and requested to stay on as Vice-Chairman.

The Committee was again pleased to have as a visitor to its

meetings Mr C J van Rooy of the S A Transport Services' Electrical Laboratory, Johannesburg, and enjoyed and appreciated his useful and interesting contributions. His guidelines on corrosion which was issued as Technical Bulletin No 8 was received and copies were circulated among the members of the Committee, following bulletin No 7 by Mr M C du Plessis of the Department of Posts and Telecommunications.

The question of earthing practice and related problems was of necessity raised again. While appreciating the apparent incompatibility of safety considerations in respect of life and property with those of stray current and consequent electrolysis frequently associated with neutral earthing or P M E, it would be appreciated if the relevant proposed code could be finalised soon.

It was some years until recently that reports of corroding waterpipes on domestic premises alleged to be due to stray earth currents were received here. Brackenfell Municipality has now experienced such a problem. The matter is under investigation jointly by that Municipality, ESCOM and the S A Transport Services.

As might have been learned from SABCTV News, two serious bursts occurred within a few weeks of each other on a section of a reinforced concrete pipeline in the Cape Flats area. A special commission of enquiry has now found that the cause of the failure of the reinforcing which led to the bursting of the pipes was excessive alkalinity.

An interesting notification of a proposed new pipeline for carrying molasses in the Cape Town harbour area has been received.

Minutes of meetings of the Main and other Regional Committees were tabled and together with other correspondence and relevant technical data submitted, provoked some interesting discussion. Among the many other items discussed were bonding, cathodic protection, test procedures and results, sleeves under railway tracks, codes of practice, consultants and a new road over rail bridge at Wellington.

The Committee is again pleased to report that electrolytic corrosion in its region is still well under control generally, having received relatively few complaints during the period under review.

Credit is again due to the Regional Manager, S A Transport Services, Cape Town and his staff for their usual prompt cooperation and also for providing the venue, secretarial services and the refreshments served during meetings of this Regional Committee.

**6. CAPE EASTERN REGION (J D Dawson)**

**Reports from Electrolytic Corrosion Committees**

In respect of the Eastern Cape Region a committee has not yet been formed for this purpose and I therefore have nothing to include in your report.

*Saamgestel deur  
A J VAN DEN BERG PR ING*

**MR AJ VAN DEN BERG: KRUGERSDORP**

Dankie mnr die President. Ek moet spesifiek verwys na die hoofkomitee en dan ook na 'n vergadering wat gehou is op die 24ste September 1986 en ek kwoteer 'n stukkie uit die Voorzitter se vraag in die notule van die vergadering onder item 6.3.2.

The Chairman enquired as to the present status of the AMEU Code of Practice on Earthing of Domestic Electrical Supplies. Mr du Plessis, my representative in this case, advised that he had discussed the matter with Mr Kitching from the SABS who in reporting that the SABS had the draft of the AMEU and Appendix E of SABS Code of Practice 0199 1985. Mr Kitching advised that due to lack of funds and of staff no progress had been made and Mr du Plessis said that he would refer the matter to the AMEU Executive Council.

This was done Mr President. Mnr Davies van Pietermaritzburg het toe ook aan die vergadering van die Uitvoerende Raad ver-

slag gedoen en het 'n konsep voorgelê wat uiteindelik gesirkuleer is aan al die Uitvoerende Raadslede en ek dink ons wag nog vir 'n gesamentlike verslag om die saak te finaliseer. Dit is al wat ek het oor my afdeling. Dankie.

**MR GG GILMOUR: CAPE TOWN**

Mr Murphy quite correctly stated in his report that I have been associated with the Cape Western Committee for 21 years. That is the life of the Cape Western Committee, so if I'm showing signs of corrosion nobody will be surprised. Attendance at these meetings have been very interesting, stimulating and useful and I must say that the people who attend these meetings are not necessarily corrosion engineers who are experts, but they are engineers or technical people and their job is to look after the buried assets of the organisations whom they represent on these committees.

Now we are grateful of course to the South African Transport



Services for their co-operation at all times, and particularly for providing drainage diodes when we need them. I have noticed in the reports that most of these reports for diodes seem to come from the Natal region. I don't know why, but perhaps the Natal representative might be able to comment on that. As you may remember, when I presented my paper to you in Bloemfontein in 1984, which incidentally became South African Electrolytic Corrosion Technical Bulletin No. 6, I did mention that the most important diodes in the Cape is the tie between our Steenbras Water pipelines and the railway line in the Strand/Somerset West area and I think that I should also mention that, strangely enough, that except for diodes and high rupturing capacity fuses we have not found it necessary to include any other devices in the circuitry in the bonds, such as we find in the Transvaal where they've got other additional devices but I think that is probably on account of the additional lightning hazard which we haven't got here in the Cape.

Now Mr Murphy did refer to two bursts in the pipelines in the Cape. It did cause a bit of a scare, but we were very relieved when we found that although it was near to a railway line, the trouble was not due to electrolytic corrosion. I might add that anybody whose got colleagues with concrete pipes whether they are pre-stressed or otherwise, we have a lot of information available and I must say that in our Committee we are grateful to the technical data and bibliography that is presented to us from time to time.

There is a little doubt that at least one reason for finalising the proposed Code of Practice, to which Mr van den Berg referred to earlier, is no doubt the incompatibility between safety considerations and electrolytic corrosion problems which do arise due to multiple earthing. All I can say is that judging from these committee reports it is apparent that electrolytic corrosion is under adequate control in this country and to a large extent due to the existence and efforts of the Regional Committees thus conforming to the experience of other countries in this regard which was another significant point I made when I addressed the Convention in Bloemfontein.

#### PRESIDENT:

Thank you Mr Gilmour. What about A.C. electrified railway lines and possible electrolytic corrosion?

#### MR GG GILMOUR: CAPE TOWN

Mr President, yes, this did crop up. The Department of Water Affairs was concerned with water pipelines and I believe the oil industry group was also concerned. But we were not quite sure what they were worrying about because there was no actual evidence ever presented of corrosion.

It seems to me they were just taking precautions. The Sishen Saldanha line is an alternating current electrified railway and up to now there has been no evidence in this country at all of any corrosion due to alternating current. But we do know it can happen, but on a very very small scale. So I don't think at this stage Mr President that we can really go into this unless there's a representative of the Department of Water Affairs or the oil industry group, who would like to comment further. But as far as our committee is concerned we have no evidence of any corrosion taking place but I do know they are taking precautionary measures.

We have an application for a bond between the railway line and one of the pipe-lines in the Saldanha/Vredenburg area but we are not quite sure why they asked for it because it's quite a long way from the nearest direct current electric railway which is at Kraaifontein. Whether they were possibly worried about possible leaking alternating currents from the high voltage AC systems. So that is all that I can tell you.

#### MNR HEYDENRÛCH: MIDDELBURG TVL

Mnr die President, ek voel soos die seuntjie wat die koning se gekleurde klerie nie kon raaksien nie, maar ek wil tog 'n vraag vra aan die sameroeper van hierdie komitee, en dit gaan oor al die skade wat aangerig word deur dwaalstrome.

Jaar na jaar by die Tegniese Vergaderings en die Konvensies sien ons eintlik lyste van instansies of gevalle waar daar skade plaasvind op waterpepe en ander installasies, en so ver ek kon vasstel is daar nog nie 'n sent skadevergoeding betaal deur die voorskieningswerbeide van instansies wat vir hierdie dwaalstrome se skade verantwoordelik is nie.

Nieteenstaande die bepaling in die Elektrisiteitswet dat dit aanvaar word dat as daar skade is dan is dit as gevolg van nalatigheid aan die kant van die voorsiener, word daar geen skadevergoeding uitbetaal aan die persone of instansies wat skade ly as gevolg van dwaalstroom verwerping nie. Kan u vir my miskien die antwoord daarop gee, dankie.

#### PRESIDENT

Mnr van den Berg het u 'n antwoord vir mnr HeydenrÛch? Het u enige gedagtes oor die aangeleentheid oor die eise wat wel ingestel behoort te word, of kan word.

#### MNR AJ VAN DEN BERG: KRUGERSDORP

Mnr die President, hierdie vraag slaan 'n ou nou so tussen die oë. Ek het nie 'n benul watter departement daarvoor verantwoordelik is nie, ek weet nie waar 'n ou moet begin nie. Ek dink ek sal maar so 'n bietjie met mnr Gene HeydenrÛch gesels om presies te hoor wat hy in gedagte het en dan kan 'n mens die saak dalk opvolg, baie dankie.

#### PRESIDENT:

Goed dankie mnr van den Berg. Geen verdere navrae of bespreking nie? Mnr van den Berg u wil nog iets byvoeg.

#### MNR AJ VAN DEN BERG: KRUGERSDORP

Mnr die President - U sal onthou dat die Uitvoerende Raad gevra het dat ek moet optree as sameroeper ten einde al hierdie verslae van die verskeie streke in een verslag voor te lê.

With reference to the activities of the main committee, Mr President, I would like to refer to item 6.3.2, page 1, where the Chairman enquired as to the present status of the AMEU Code of Practice on earthing of domestic electrical supplies. He was advised that due to a lack of funds and staff the SABS reported no progress. Fortunately the SAIEE had taken this matter up and Mr EG Davies (Pietermaritzburg) might have more to say about this.

#### MR GORDON DAVIES: PIETERMARITZBURG

Mr President, this item has rather been sprung on me. I neither have the old or amended Code of Practice with me, so all I can really say is, what in fact is happening.

Now the Code of Practice for PME and MEN earthing has been available for some time, but the Power Section of the SAIEE and some AMEU members, considered that it was outdated and that it needed considerable revision. Now this was considered by Mr Vic Raynall, who is here, and myself, and we made certain alterations to the Code. We had it circulated to AMEU members and asked for comments from the various members. These were received and correlated and we now have the Code in a form which is virtually ready for re-issue.

Having done that, at the Workshop in Pretoria held by the SAIEE, there was a gentleman there from Eskom, Mr Brookling, who made some comments on earthing generally, and as a result of that, it looks as if we have to go back again and consider those comments and ask for further comments from Eskom, so that the Code, when it is issued, will be complete and correct.

As I say I do not have the Code with me, but if there is anybody who wishes to comment on the Code, which I believe was originally drawn up by Johannesburg, we would be pleased to receive comments on it and you can contact or send them directly to myself in Pietermaritzburg.

It is envisaged that the Code will be ready for issue to AMEU members in about a month or so. I am sorry that I don't have the Code with me so that I could address particular specific problems.

Mr Chairman that is all I have to say. Thank you.

**MR DH FRASER: DURBAN**

Mr President, not a comment, but only an enquiry. Durban has gone over completely to a MEN multiple earth neutral system and saving a lot of money thereby. I don't know whether the cable manufacturers are pleased about it, but it certainly is an economic way of distributing electricity and we haven't experienced any problem with this system. It would be interesting to know whether Municipalities generally are using this form of distribution and whether there are any difficulties associated with it that perhaps need to be taken into account, and possible inclusion in revision which is being made of the Code. Thank you.

**PRESIDENT:**

Your question is whether other undertakings have in fact gone over to the MEN system. Before we ask the general question is there any further comment on this. Is daar nog enige verder kommentaar. Is daar plaaslike besture of owerhede wat oorgeskakel het na hierdie sisteem? Not a single one.

**MR K MURPHY: SOMERSET WEST**

Mr President, please clarify this for us because most of us are running multiple earthed neutral systems. Are you referring to the system where the neutral is earthed at the house or where the distribution system is simply earthed in the street, because I know the names have changed and PME and MEN confuses me.

**PRESIDENT:**

Well the question then should be: Who is at present on the MEN system? If you are presently on the MEN system then of course you haven't changed to it. Is it earthed at the houses? Is this generally done?

**MR K MURPHY: SOMERSET WEST**

Mr President, this is in fact not the case, because a lot are not earthing at the houses but in the streets at the kiosks and low voltage system. Years ago Port Elizabeth and Johannesburg were doing it, unless I am mistaken.

**MR DH FRASER: DURBAN**

Mr President I just find this a little puzzling. If everybody, or a large majority, were using this particular system, why was it necessary to draw up a Code, as if it was something new. And why was it necessary to establish a new standard for a cable suitable for a MEN system, leaving out the fourth core and having the neutral combined with the earth as the outer conductor. I am just in a bit of a quandry. I find it a bit of a mystery.

**PRESIDENT:**

I wonder Mr Davies could you and then perhaps, a Cable Manufacturer or one of the Consulting Engineers also contribute.

**MR GORDON DAVIES: PIETERMARITZBURG**

Mr President in reply to Mr Fraser's question, the Code of Practice for PME and MEN has been in existence, I would guess for about ten years, so it hasn't been drawn up suddenly. It sets out clearly the way that it should be done for PME or MEN and what we are doing is looking at the Code and updating it. It's nothing new and unfortunately as I said I don't have the Code with me, but the methods of adopting either one of the systems are clearly set out in the Code as to where you earth and what you earth.

I certainly would be pleased to send a copy of the diagrams at least, to those people who have any doubts about it, but it is clearly set out in the Code.

**MR DU TOIT: SOWETO**

Mr Chairman I would just like to point out that it depends on

the circumstances. Whether you have metal water mains or PVC water mains, or asbestos cement for that matter, and that vandalism may also play a role in selecting the appropriate system. Thank you.

**PRESIDENT:**

Is that your main consideration in Soweto?

**MR DU TOIT: SOWETO**

No Mr President, our system isn't installed. You know it is still under consideration at this stage. I am merely suggesting that in looking at new developments in new areas, one should take these matters into account.

**MR V COHEN: AFFILIATE**

Mr Chairman, having listened to some of the comments and the progress Mr Davies and Mr Raynall have made with the revised Code of Practice, it appears to me that there is still a large degree of confusion amongst many people. I myself, have been confused many times about these various systems. Since we have reached this stage of development requiring a revision of the Code of Practice, may I suggest that through the AMEU we issue a questionnaire to all utilities and try to establish where do we stand, what kind of systems are in fact in use throughout the Country?

I think that we have reached the stage where we should possibly draw up some sort of data base in knowing what different type of systems are in use. Not only will this be good input for all of us, but at the same time I believe, it will go a long way into assisting the understanding of the various systems and help to get us all on a common basis. And Mr President through you I suggest that this is the right body to initiate such a questionnaire.

**PRESIDENT:**

Thank you Mr Cohen for that suggestion. Mr Davies could you make a note of that and bear it in mind please.

**MR M CLARKE: RANDBURG**

I would like to support Mr Cohen's comment. I can tell you that when we started looking at this in Randburg, we found unwittingly that we had two systems going. I think most Undertakings will find that they have a very complicated set up and they may not realise it. Right under their noses.

**PRESIDENT:**

All right. I think this a good suggestion. Mr Davies I wonder if you could keep this in mind.

**MR W BARNARD: ELECTRICITY CONTROL BOARD**

Mr President, I wish to make a very quick comment. First of all, in Johannesburg we have a fully earthed system. We have no multiple earth neutral at all. When we did the reticulation in Soweto because of cost considerations and other factors we installed a split neutral and therefore we had a multiple earth neutral system there.

The problems arose with the introduction of mini-subs where you are earthing your low voltage and high voltage systems at the same point, or virtually at the same point. You can get the high voltage imposed on the low voltage system. The reason why Johannesburg has always had a fully earthed system is because, particularly for our overhead lines, it is part of our protection of low voltage overhead lines to have two earth conductors on the poles with crossbars.

**PRESIDENT:**

Thank you Mr Barnard. Any further contributions?

# THE NBRI STEERING COMMITTEE ON SOLAR ENERGY CONSERVATION IN BUILDINGS AND BUILT ENVIRONMENT

## MR MURPHY: SOMERSET WEST

Mr President since the report is non-existent I have nothing to add to it. May I just clarify the situation by explaining that I took over this committee from Mr Dennis Palser and that nothing has happened in the two years, that we are aware of. Perhaps Mr Palser would like to do some explaining, thank you.

## MR PALSER: HONORARY MEMBER

Yes, I didn't expect Mr Murphy to throw that one at me. Anyway as I understand it, this committee has not been disbanded, but I think it has just been put aside, because there is nothing further going on at the moment. It might be instituted again at a

later stage.

## MR ARNOLD LAP ex NBRI:

Due to many retirements and people going on pension the committee has temporarily lapsed its activities but further research is still being carried out on solar work and also particularly on energy and electrical energy use in buildings and high rise buildings. That is an ongoing research project. Thank you Mr President.

## MR BASSON: WNNR

Mr die President ek het niks verder om by te voeg nie. Ek weet nie of daar nog enige ander kommentaar is nie.

## NNEI KRAGSUBKOMITEE: VERSLAG

Twee vergaderings was in dié tydperk gehou, naamlik op 7 Oktober 1985 en 2 Oktober 1986.

Die taak van die subkomitee is om die jaarverslag en navorsingsprogram te bestudeer en insette daartoe te lewer.

'n Hele aantal projekte, waarvan sommige hieronder genoem, word tans aan gewerk en by voltooiing van enige projek word die resultate gedokumenteerd en in die vorm van 'n publikasie vrygestel.

Weerligsteierings.

Optimale ontwerp van oorhoofse lyne, spesifiek met weerlig in gedagte.

Meting van weerlig impuls spannings.

Die effek van humiditeit en lugdruk op die werfverrigting van lugisolasie.

Dinamiese impedansie van aardelektrodes.  
Elektries aangedrewe passasiersmotor.

Meer inligting sal met graagte aan enige lid verskaf word, indien daar belangstelling is.

Serdedien het die WNNR besluit om weg te doen met Advies- en Subkomitees en Komitees van die Raad. Dit word voortaan aan die onderskeie institute oorgelaat om self te besluit op watter manier hulle steeds kommentaar oor en insette tot hulle programme gaan verkry.

Die NNEI- bestuur besin tans oor metodes om te verseker dat die kontak met en advies van lede van die voormalige Subkomitees behoue bly. Hulle beoog onder meer om moontlik, in-stede van komitees, panele van deskundiges aan te stel om die Instituut oor kleiner groeppies projekte te adviseer.

M J HUMAN PR. ING.  
ELEKTROTEGNIËSE STADSINGENIEUR: BRAKPAN  
Verteenwoordiger

## CSIR/NEERI ADVISORY COMMITTEE

### DR NAUDE VAN WYK: CSIR

Mr President, I think it's not correct to say that Mr Leigh combined any report on NEERI's activities in the High Voltage Coordinating Committee Report.

Only those where NEERI is jointly active with other bodies in the high voltage field has been reported there. The other report covers the complete area of activities at NEERI which includes such things as micro-electronics, telecommunications, industrial technology etc. But as the Advisory Committee in fact has fallen away, I am not surprised that Mr Leigh did not write a report

thereon, and I would just refer you again to the fact that we have available an Annual Report 1986, which covers the highlights of the work that we are doing in these diverse fields and I think if members would just let me know if they have not received the report, then I'll send it to them.

### PRESIDENT:

Thank you. You have the offer from Dr van Wyk. I am just sorry that Mr Leigh is not here to enlighten us on this aspect, but thank you Dr van Wyk.

## DR N BOTHA: BLOEMFONTEIN

Mnr die President, namens die Vereniging wil ons vir u net graag baie dankie sê vir 'n goed saamgestelde en volledige verslag.

Ons merk uit die verslag mnr die President, dat u verkies is om op die SANKV Uitvoerende Komitee te dien. Ons wil u van harte geluk wens met u verkiesing en ons vertrou dat u ook u invloed sal gebruik.

Verder mnr die President, word daar opgemerk dat u kommer uitspreek oor die feit dat daar relatief min VMEO lede by vergaderings van die SANKV teenwoordig is. Wat ek graag onder u aandag wil bring is, ek praat onder korreksie mnr die President, maar ek dink die S.A. Nasionale Komitee vir Verligting word nie erken deur die Verenigde Munisipale Bestuur nie, en ek glo dit is een van die redes waarom so min VMEO lede hierdie vergadering bywoon. Ek wil dus egter voorstel dat u dit een van u doelwitte maak om erkenning vir SANKV by die VMB te verkry. Dankie.

## THE AMEU/ILESA/SANCI STREET LIGHTING ADVISORY COMMITTEE: REPORT

This report covers the activities of the AMEU/ILESA/SANCI Street Lighting Advisory Committee.

### HISTORICAL:

On 29 Februarie 1978 a symposium entitled "Practical and Economic Road Lighting" was held in Johannesburg. This symposium was a joint project of the AMEU, ILESA and SANCI. During the discussion period it became evident that the participants felt that a lot of common problems could be alleviated if a special committee could be formed to investigate these problems. As a result two members of each of the three organisations were appointed to form the new "Street Lighting Advisory Committee". The appointed members are as follows:-

AMEU Messrs. J K von Ahlfen and A H L Fortmann  
ILESA Messrs. J Grundy and R Yates  
SANCI Messrs. H Steyn and A Claasen

Subsequently the SANCI members were replaced by Messrs Mike Gifford and Connie Jonker while Mr M Martins was co-opted onto the Committee.

At its first meeting, the committee agreed to draw up guidelines on all aspects of street lighting, for the benefit of its members. The guidelines would be compiled with the assistance of outside experts in the various fields and published as and when they were completed.

The guidelines are split up into ten projects, as follows:-

- Project 1 : Poles
- Project 2 : Luminaires
- Project 3 : Lamps and Control Gear
- Project 4 : Maintenance
- Project 5 : Incentive and Economics
- Project 6 : Reticulation
- Project 7 : Personnel and Safety Requirements
- Project 8 : Training
- Project 9 : Design Parameters
- Project 10 : Vehicles and Plant in Use on Street Lighting

### PRESENT SITUATION:

All the projects, except Project 9 have been completed.

With regard to "Project 9: Design Parameters", the Committee held a meeting on 27 March 1985 where it was resolved to firstly revise the SABS Code On Street Lighting before compiling Project 9.

## PRESIDENT:

Dankie Dr Botha. Ek dink tog daar is van die Provinsiale Munisipale Verenigings wat SANCI erken. Sou u sê Vrystaat is een wat dit nie erken nie? Weet iemand of die Kaap en Natal SANCI erken as amptelike instituu?!

## MNR JA LOUBSER: BENONI

Mnr die President, in Transvaal is dit nie so dat elke plaaslike bestuur dit kan bywoon nie. As ek reg onthou was daar 'n inkomste beperking. As 'n sekere dorp se inkomste nie bokant daardie perk is nie, dan kan hy nie 'n lid wees van SANCI nie. Dit is wat ek dink wat reg is. Dankie.

## PRESIDENT:

Dankie mnr Louber. Ek wonder, hierdie versoek is dalk 'n goeie een. Ek wonder of ons dit nie na die Uitvoerende Raad moet verwys en bespreek en sien of ons vertoë kan rig tot die VMB om te sien of ons iets daardeur kan bewerkstellig.

## DIE VMEO/IVISA/SANKV STRAATVERLICHTING ADVISERENDE KOMITEE: VERSLAG

Hierdie verslag dek die bedrywighede van die VMEO/IVISA/SANKV Straatverligting Adviserende Komitee.

### GESKIEDKUNDIG:

'n Simposium, getitel "Practical and Economic Road Lighting" was op 28 Februarie 1978 in Johannesburg gehou. Dit was 'n gesamentlike projek van die VMEO, IVISA en SANKV. Tydens die besprekings het dit duidelik geword dat die deelnemers die mening toegedaan is dat 'n spesiale komitee, wat vir die doel saamgestel behoort te word, baie van die probleme kan ondersoek en op die manier die taak vergemaklik. Gevolglik was twee lede van elk van die drie organisasies aangestel om die nuwe "Straatverligting Adviserende Komitee" te vorm. Die aangeselde lede is soos volg:-

VMEO Mnr. J K von Ahlfen en A H L Fortmann  
IVISA Mnr. J Grundy en R Yates  
SANKV Mnr. H Steyn en A Claasen

Daarna is die SANKV lede vervang deur Mnr Mike Gifford and Connie Jonker terwyl Mnr M Martins tot medielid op die komitee verkies is.

By die eerste vergadering het die komitee ooreengekom om riglyne oor alle benaderings in verband met straatverligting, tot die voordeel van sy lede op te stel. Die riglyne sou met behulp van buitestaande deskundiges in die verskillende rigtings saamgestel word en wanneer dit gereed is, gepubliseer word.

Die riglyne is in tien projekte soos volg opgedeel:-

- Projek 1 : Pale
- Projek 2 : Lanterns
- Projek 3 : Lampe en Beheertoerusting
- Projek 4 : Instandhouding
- Projek 5 : Aansporing en Besparing.
- Projek 6 : Benetting
- Projek 7 : Personeel en Veiligheidsvereistes
- Projek 8 : Opleiding
- Projek 9 : Ontwerpparameter
- Projek 10 : Voertuie en Toerusting in Gebruik by Straatverligting

### HUIDIGE STAND VAN SAKE:

Al die projekte, behalwe Projek 9, is voltooi.

"Projek 9: Ontwerpparameters". Die Komitee het met sy vergadering van 27 Maart 1985 besluit dat die SABS Gebruikskode Oor Straatverligting eers gewysig word voordat Projek 9 opges-



The Committee is now holding back on this issue to await a possible decision by the CIE at their meeting in Venice in June 1987, where it is hoped a direction will be received of what technique is to be followed.

The Committee will then most likely follow suit.

Apparently due to a lack of orders, "Vector", which previously published the Guidelines For The Installation And Maintenance Of Street Lighting, has discontinued printing them.

Steps are now being considered to find a new publisher.

It is a great pity that AMEU members appear to be reluctant to make use of these Guidelines, which are considered to be invaluable, to engineers, middle management, electricians and street lighting attendants in local authorities.

When a new publisher has been found, efforts will be made to make this known to AMEU members.

*A H L FORTMANN  
Representative*

#### MR D GILBERT: AFFILIATE

Mr President it is not correct in the report where you state, that due to a lack of orders, we've discontinued printing the guidelines. On the contrary in fact we have had a number of orders over the years. Originally we printed about 200 copies and we've had orders to date for over 100 and we do still have stocks of the guidelines. In fact I have got a limited amount with me, but they are available priced at R6,00 each.

I think that we must get our heads together and do a bit more as to the promotion of the selling of the guidelines, and if there is any further discussion required as to formats that they are in at the moment, then I am quite happy to talk about that.

#### PRESIDENT:

I am glad you mentioned this fact Mr Gilbert. But first of all, the information I had, was that in fact Vector was not going to print these any longer. This is the information that I had, and I think I got it from Mr Robbie Yates of Johannesburg. Either him or Mr John Grundy, that Vector was not going to print these any longer.

#### MR GILBERT: AFFILIATE

That kind of information can only originate from myself and that is certainly not the case Mr President.

#### PRESIDENT:

I am pleased to hear this and about promoting the guidelines, I must say that I support this. In every report that I have drawn up

tel word.

Die komitee hou hierdie aangeleentheid oor en wag vir 'n besluit wat moontlik deur die CIE tydens hul vergadering gedurende Junie 1987 in Venesië gehou word, waar daar gehoop word dat 'n rigting oor watter tegniek gevolg moet word, verkry sal word.

Die komitee sal dan heelwaarskynlik dieselfde tegniek gebruik. Blykbaar het "Vector", wat voorheen die Riglyne Vir die Installasie En Instandhouding Van Straatverligting gepubliseer het, weens 'n tekort aan bestellings, die publikasie daarvan gestaak. Stappe om 'n nuwe uitgewer te vind, word nou oorweeg.

Dis 'n groot jammer dat VME0-lede onwillig blyk te wees om van die riglyne gebruik te maak, aangesien die riglyne waardevolle inligting bevat wat deur ingenieurs, middelbestuur, elektrisiëns, en straatligbedieners van plaaslike owerhede gebruik kan word.

Sodra 'n nuwe uitgewer gevind is, sal daar gepoog word om die VME0-lede daarvan in kennis te stel.

*A H L FORTMANN  
Verteenwoordiger*

since this matter was brought up, I have mentioned the guidelines in the report and I can only appeal to the AMEU members to consider buying these. They are quite cheap.

Dit is handige riglyne ek kan u sê dit is nie noodwendig net vir die ingenieur se gebruik nie. Ek meen hy kan dit vanselfsprekend gebruik, maar dit is ook vir die gebruik van die Superintendente, die Elektrisiëns en selfs die straatligbediener kan dit baie handig gebruik.

But it can certainly be used by your Technicians and your Assistant Engineers or yourself, and there is some very useful information in it. It is not complete yet. I think Project 9 is not yet available but we are busy working on that.

Mr von Ahlften and I are your representatives on this committee. The SABS is represented and SANCI is represented. I think the SABS members represent ILESA. Any way there are a number of organisations represented and there is one project outstanding. This is a very useful document. So there you heard Mr David Gilbert, he is here and you've seen him. Please approach him and ask him for those copies.

You know we have the Street Lighting Code issued by the SABS. This Code is under revision and Project 9 will in fact look at the revision, including walkway lighting and sidewalk lighting. Walkway lighting is to tie in with the revised guidelines for the reticulation and distribution of electricity in residential townships. Project 9, will in fact form part and parcel of the revised guidelines. Am I right Mr von Ahlften? Yes, so I suggest you should get a copy of these guidelines on street lighting and when Project 9 is complete it will be of far greater value. Thank you.

## THE SOUTH AFRICAN NATIONAL COMMITTEE ON ILLUMINATION: REPORT

This report covers the activities of SANCI for the two years 1985 and 1986.

Thirty Second Annual General Meeting And Congress - 1985: The 32nd Annual General Meeting and Congress of SANCI was held in East London from 4 to 5 November 1985.

The theme of the Congress was "Illumination In The Computer Age".

On Monday 4 November 1985, His Worship the Mayor of East London, Councillor J A Yazbek, delivered the welcoming address for delegates to East London after which the presidential

## DIE SUID-AFRIKAANSE NASIONALE KOMITEE VIR VERLIGTING: VERSLAG

Hierdie verslag dek die bedrywighede van SANKV vir die twee jaar 1985 en 1986.

Twee En Dertigste Algemene Jaarvergadering En Kongres - 1985-

Die 32e Algemene Jaarvergadering en Kongres van SANKV was vanaf 4 tot 5 November 1985, in Oos-Londen gehou.

Die tema van die Kongres was "Illumination In The Computer Age".

Op Maandag 4 November het Sy Agbare die Burgemeester van Oos-Londen, Raadslid J A Yazbek, die verwelkomingsrede vir

address was delivered by the President of SANCI, Mr N A L Allen.

The first paper was delivered by Dr H Einhorn, Consulting Engineer from Cape Town, entitled "Beyond The Lux Levels".

The next paper was by an overseas guest speaker, Dr Wolfgang Egger on "Lighting Design By Computer".

Dr Egger described highly sophisticated computer programmes termed "COFHOS", and is largely used in illumination of rooms and surrounding surfaces in a room.

Along similar lines of computer design, Mr E D Williams presented a paper, after Dr Egger's paper, on Computer Applications.

The next paper entitled "Lighting As An Aid To Security" was presented by Mr L O Foster and was of special value to Municipal Engineers, as it covered lighting for security under present day conditions of terrorism, civil strife and disorder.

During the business meeting, proposals were put forward by the SANCI Executive Sub-Committee, as well as by Mr A H L Fortmann, on amendments to SANCI's Constitution.

A lengthy discussion and debate followed on this aspect and eventually on amicable balance regarding the amended constitution, was arrived at.

After the election of office bearers, the CIE report, by Messrs Grundy and Yates, was presented.

On Thursday morning the first speaker was an overseas guest speaker, Dr R Berzolla, and his paper was entitled "Computer-Aided Airfield Lighting".

Mr H D Beck, Deputy City Electrical Engineer of East London, delivered a paper on "Progress Of Public Lighting Over The Last Decade". This paper was of particular interest to City and Town Electrical Engineers, as it covered public road lighting.

The following papers were then presented:

"Colour Appearance Analysis" by Mr A N Chalmers.

"Economic Life Of Incandescent Lamps" by Mr J J Sullivan.

"Studio Lighting" by Mr E H Cutler.

"VDU Lighting" by Mr J H Dempster.

"Benefit Of Electronic Lighting" by Mr G Gallas.

"Daylighting" by Mr L I Boyd of the CSIR.

"An Update On Mast Design And Specifications To Meet SABS Requirements" by Mr A T Thomas.

The 33rd Annual General Meeting and Congress of SANCI was held in Johannesburg from 27 to 29 October 1986.

The theme of the Congress was "Illuminance ambience in the work, transport and leisure environment".

On Monday 27 October 1986, His Worship the Mayor of Johannesburg, Councillor Professor Harold Rudolph, delivered the welcoming address for delegates to Johannesburg after which a film on the theme of the Congress was shown and the presidential address was delivered by the President of SANCI, Mr N A L Allen.

The Keynote address was by Mr Bruno Penzhorn.

Papers presented on Monday 27 October 1986, were the following:-

"Lighting as an aid to the operation of an Escom pumping station" by Mr L O Foster.

The paper covered the Drakensberg Pumped Storage Scheme and was followed with great interest.

"Energy-effective direct/indirect office and VDU lighting systems" by Dr E Klein.

"Urban lighting: for the man in the street" by Mr R S Yates.

Late afternoon saw the election of office bearers and business meeting being conducted.

Mr Hennie Steyn was elected as the new President of SANCI and was inducted on Wednesday, 29 October 1986, shortly before the final closing.

die afgevaardigdes na Oos-Londen gelewer waarna die presidentsrede deur die President van SANKV, Mnr N A L Allen, gelewer was.

Die eerste referaat was deur Dr H Einhorn, raadgewende ingenieur van Kaapstad, gelewer en was getitel "Beyond The Lux Levels".

Die volgende referaat was deur 'n oorsese gaspreekster, Dr Wolfgang Egger oor "Lighting Design By Computer" gelewer.

Dr Egger het hoogs gesofistikeerde rekenaarprogramme genaamd "COFHOS" beskryf, en is hoofsaaklik vir verligting van kamers en omliggende oppervlaktes in 'n vertrek.

Mnr E D Williams het ook 'n referaat ook rekenaarontwerp aangebied na dr Egger se referaat oor rekenaarontwerp.

Die volgende referaat, genoem "Lighting As An Aid To Security" was deur Mnr L O Foster aangebied en was van besonder waarde vir munisipale ingenieurs omdat dit verligting vir hedendaagse sekuriteitstoestande a.g.v terrorisme, burgerlike onrus en wanorde gedek het.

Gedurende die besigheidvergadering was voorstelle deur die SANKV Uitvoerende Subkomitee, asook deur mnr A H L Fortmann ingedien, oor wysigings aan SANKV se grondwet.

'n Lang bespreking en debat het hierna gevolg oor hierdie onderwerp en uiteindelik is 'n minlike skikking aangaande die gewysigde grondwet bereik.

Na die verkiesing van bestuurslede, was die CIE verslag deur Mnr Grundy en Yates voorgelê.

Die eerste spreker op Donderdagoggend was 'n oorsese gaspreekster, nl dr R Berzolla, en sy referaat was getitel "Computer-Aided Airfield Lighting".

Mnr H D Beck, Adjunk Elektrotegniese Stadsingenieur van Oos-Londen, het 'n referaat aangebied oor "Progress Of Public Lighting Over The Last Decade". Hierdie referaat was van besondere belang vir Elektrotegniese Stadsingenieurs aangesien dit openbare straatverligting gedek het.

Die volgende referate was toe aangebied:

"Colour Appearance Analysis" deur Mnr A N Chalmers.

"Economic Life Of Incandescent Lamps" deur Mnr J J Sullivan.

"Studio Lighting" deur Mnr E H Cutler.

"VDU Lighting" deur Mnr J H Dempster.

"Benefit Of Electronic Lighting" deur Mnr G Gallas.

"Daylighting" deur Mnr L I Boyd van die WNNR.

"An Update On Mast Design And Specifications To Meet SABS Requirements" deur Mnr A T Thomas.

Die 33e Algemene Jaarvergadering en Kongres van SANKV was vanaf 27 tot 29 Oktober 1986 in Johannesburg gehou.

Die tema van die Kongres was "Illuminance ambience in the work, transport and leisure environment".

Op Maandag 27 Oktober 1986, het sy agbare die burgemeester van Johannesburg, Raadslid Professor Harold Rudolph, 'n verwelkomingsrede vir afgevaardigdes na Johannesburg gelewer, waarna 'n film oor die tema van die Kongres vertoon was en toe was die presidentsrede deur die President van SANKV, Mnr N A L Allen, gelewer.

Die hoofrede was deur Mnr Bruno Penzhorn gelewer.

Op Maandag 27 Oktober 1986, was die volgende referate gelewer:-

"Lighting as an aid to the operation of an Escom pumping station" deur Mnr L O Foster.

Die referaat het oor die Drakensberg Bergingspompstema gehandel en was met groot belangstelling gevolg.

"Energy-effective direct/indirect office and VDU lighting systems" deur dr E Klein.

"Urban lighting: for the man in the street" deur Mnr R S Yates. Die verkiesing van ampsdraers en besigheidvergadering was laat middag gehou.

Mnr Hennie Steyn was as nuwe President van SANKV verkies

Mr A H L Fortmann was elected onto the Executive Sub-Committee.

On Tuesday 28 October 1986, the following papers were presented:-

"Lighting design - flair before figures" by Mr R Aldworth  
"Novel locally designed light measuring robot" by Dr F Hengstberger.

This light measuring robot for the measurement of the luminous intensity distribution of lamps and luminaires which was designed and developed by Dr Hengstberger of the CSIR, is claimed to be the leading instrument of its kind in the world and is built locally at substantially lower cost than imported measuring equipment.

"Lighting for the Johannesburg Art Gallery Extension" by Mr M J F Dempster.

"Lighting for plant growth" by Dr H D Einhorn.

"Character heights and viewing distances for photo-luminescent signs" by Mr I Boyd.

"The development of theatre and studio lighting in South Africa" by Mr E H Cutler.

Prior to the first paper being delivered, CIE matters under the chairmanship of Mr J T Grundy were discussed.

During the afternoon, after the last paper, there was a presentation of current lighting equipment followed by a mini-exhibition.

Papers presented on Wednesday 29 October 1986 were the following:-

"Design for maintenance" by Mr P A Davies.

"V - curves and the use thereof" by Dr R W Leuschner.

"Measurement of spectral reflectance and colorimetric properties of Namib beetles" by Mr L A G Monard.

"Design criteria for lighting ambience" by Messrs K H Mackenson and D M Lee.

Dr Terstiege then presented an address on colours and lighting. A short seminar on plastic bowls for street lighting luminaires, chaired by Mr Robby Yates, was then held.

Both Congresses were very well organised and worth attending. Of concern to SANCI is that relatively few AMEU members are members of SANCI.

Not only would more AMEU members be of benefit to SANCI, but more importantly, the AMEU members would without doubt receive tremendous benefit.

As far as street lighting on roads and highways in our cities and towns is concerned, it has been proved all doubt that road accidents are reduced and lives are saved with good and efficient lighting. Good lighting also improves the aesthetics of a city or town.

Practically all the research that is being conducted in South Africa in the field of lighting and illumination is being carried out by members of SANCI.

Therefore to become conscious of good lighting practices, it is of tremendous benefit to be in close contact with an organization like SANCI and its members.

The following extract is quoted from the "Aims, Objects and Activities of the South African National Committee on Illumination", prepared some years ago by Dr W M H Rennhakkamp, at that time of the CSIR, regarding membership:-

"It should be realized that the scope of SANCI is so great that it could not possibly be managed by a single organization and the stronger the national team the more extensive and intensive the field that could be covered. It is important to emphasize that the Committee represents not only the field of illumination but all the allied fields. It is important that a strong membership be maintained so that illumination practice can benefit by the experience of members.

With the existence of a South African National Committee

was on Woensdag, 29 Oktober 1986, kort voor die sluiting ingehuldig.

Mnr A H L Fortmann was verkies om op die Uitvoerende Subkomitee te dien.

Die volgende referate was op Dinsdag 28 Oktober 1986, aangebied:-

"Lighting design - flair before figures" deur Mnr R Aldworth.  
"Novel locally designed light measuring robot" deur Dr F Hengstberger.

Hierdie ligmeetrobot vir die meet van verspreiding van ligintensiteit van lampe en lanterns, wat deur Dr Hengstberger van die WNNR ontwerp en ontwikkel is, word beweer om die leierinstrument van sy soort in die wêreld te wees en word plaaslik teen aansienlike laer koste as sy ingevoerde eweknie vervaardig.

"Lighting for the Johannesburg Art Gallery Extension" deur Mnr M J F Dempster.

"Lighting for plant growth" deur Mnr H D Einhorn.

"Character heights and viewing distances for photo-luminescent signs" deur Mnr I Boyd.

"The development of theatre and studio lighting in South Africa" deur Mnr E H Cutler.

Voor die eerste referaat gelewer was, was CIE aangeleentheid, onder voorsitterskap van Mnr J T Grundy, bespreek.

Gedurende die middag, nadat die laaste referaat gelewer was, was daar 'n aanbieding van huidige verligtingtoerusting, waarna 'n mini-uitstalling gevolg het.

Referate wat op Woensdag 29 Oktober 1986 gelewer was, was die volgende:-

"Design for maintenance" deur Mnr P A Davies.

"V - curves and the use thereof" deur dr R W Leuschner.

"Measurement of spectral reflectance and colorimetric properties of Namib beetles" deur Mnr L A G Monard.

"Design criteria for lighting ambience" deur Mnr K H Mackenson en D M Lee.

Daarna het Dr Ierstiege 'n rede oor kleure en verligting gelewer.

'n Kort seminaar oor plastiese skerms vir straatverligting deur Mr Robby Yates, was toe gehou.

Albei Kongresse was baie goed ge-organiseer en was die moeite werd om by te woon.

Wat vir SANKV kommerwekkend is, is dat relatief min VME0 lede ook lede van SANKV is.

Nie alleen kan VME0 lede vir SANKV tot voordeel wees nie, maar meer belangrik, kan hulle self baie baat vind as lede van SANKV.

Wat straatverligting op paai en snelweë in onis stede en dorpe betref is dit ontegenskig bewys dat die getal padongelukke en leuensverlies deur goeie en doeltreffende verligting verminder kan word. Goeie verligting verbeter ook die estetiese aansien van 'n stad of dorp.

Bykans alle navorsing wat in Suid-Afrika in die verligtingsveld gedoen word, word deur SANKV lede uitgevoer.

Om bewys te word van goeie verligtingspraktyke is dit uiters voordelig om in noue kontak met 'n organisasie soos SANKV en sy lede te wees.

Die onderstaande is 'n uittreksel uit "Aims, Objects and Activities of the South African National Committee on Illumination", wat 'n aantal jare gelede deur Dr W M H Rennhakkamp, destyds van die WNNR, met die oog op lidmaatskap, opgestel is.

"It should be realized that the scope of SANCI is so great that it could not possibly be managed by a single organization and the stronger the national team the more extensive and intensive the field that could be covered. It is important to emphasize that the Committee represents not only the field of illumination but all the allied fields. It is important that a strong membership be maintained so that illumination

on illumination problems can be stimulated and be better appreciated. The work of SANCI is a vital step in improving illumination and thus providing a substantial contribution to the improvement of the living standard of all inhabitants in this country."

AMEU members who wish to become members of SANCI should write to the secretary of SANCI at the following address:-

The Secretary,  
SANCI  
c/o CSIR  
P O Box 395  
PRETORIA  
0001

A H L FORTMANN  
*Representative*

## THE S.A. NATIONAL COMMITTEE OF THE IEC: REPORT

The SABS has advised that in order to formalise the participation of South Africa in IEC matters it is necessary to constitute the S.A. National Committee with defined functions and operating methods.

The proposed operational and functional guide for the S.A. National Committee (SANC) of the IEC is as follows:-

1. A South African National Technical Committee (SATC) is deemed to exist for every IEC TC. SATC's may form South African National Subcommittees (SASC's) corresponding to IEC SC's, if they deem it necessary, and they shall prescribe their operating relationships. STAC's and SASC's may nominate experts to serve directly on IEC WG's.
2. The SABS shall designate a responsible technical officer (TO) from within the SABS for each SATC and SASC.
3. Each SATC shall be either active or inactive, as determined by the South African National IEC Committee (SANC).
4. In the case of an inactive SATC, the TO shall deal with all matters at his own discretion, including voting on documents.
5. In the case of an active SATC, the TO shall compile and maintain a committee list, as approved by the SANC in accordance with the following guidelines:
  - a) All relevant associations and institutions should be invited to nominate a member.
  - b) Commercial organizations should be represented through an appropriate association. Exceptionally representation may be granted to a commercial organization where it is the only local organization in the field and provided it does not have close commercial ties with an overseas company in the same field. The guiding principle is to avoid multiple representation of the interests of a country or multinational organization through subsidiary operations in other countries.
  - c) Individual experts may be approached subject to the application of principle (b) above.
  - d) The chairman of any affected SABS project must be invited, with adequate provision for communication with the members of his Technical Committee.

practice can benefit by the experience of members.

With the existence of a South African National Committee on illumination problems can be stimulated and be better appreciated. The work of SANCI is a vital step in improving illumination and thus providing a substantial contribution to the improvement of the living standard of all inhabitants in this country."

VME0 lede wat lidmaatskap van SANKV wil bekom kan aan die sekretaris van SANKV by die onderstaande adres skryf:-

Die Sekretaris  
SANKV  
p/a WNNR  
Posbus 395  
PRETORIA  
0001

A H L FORTMANN  
*Verteenwoordiger*

**NOTE:** Changes in fundamental representation are subject to approval by the SANC.

6. The TO shall ensure that each active SATC elects a chairman to serve for a 3-year term. A chairman may be re-elected. The chairman may be from the SABS (in which case it would probably, but not necessarily, be the TO himself), or it may be any other member of the SATC. The same procedure applies to SASC's.
7. The SABS routinely forwards all IEC TC documents to the members of the SATC, via the address of the represented organization where relevant. Comments should be forwarded directly to the chairman of the SATC whose responsibility it is to obtain consensus on the matter, preferably through the telephone or by correspondence, but exceptionally at a meeting called in consultation with the TO. The Chairman shall then forward the response to the TO who is responsible for ensuring that it is conveyed to the IEC.

IEC SC documents are normally forwarded to the relevant SATC, unless there is a corresponding SASC.

### NOTE

- a) The SABS is not in a position to provide any financial support to SATC or SASC members or their Chairmen, but may be able to assist with meeting venues. SATC's and SASC's are free to raise funds, for example to sponsor attendance of local or international meetings by any of their members.
  - b) The TO should not be expected to provide Secretarial Services. In general, proceedings will be informal.
8. The SANC comprises the Chairman of all SATC's (but not SASC's). A Chairman may appoint another member of his SATC to attend in his absence. All TO's have the right to attend any SANC meetings as participating but non-voting members. For compatibility with ISO procedures, the SABS will provide the President (who chairs the SANC) and the National Secretary.

The following shall have the right to automatic representation on the SANC: AMEU and ESCOM.
  9. The President shall convene a meeting of the SANC whenever necessary, but at least before every IEC General Meeting.
  10. The functions of the SANC are:
    - a) to determine the depth of South African involvement in the IEC, and to review the activities of all SATC's and SASC's;
    - b) to participate (through the President) in IEC Council matters;



c) to become involved, if appropriate, in the Committee of Action; and

d) to approve membership of SATC's and SASC's.

The AMEU therefore has a right to automatic representation on the S.A. National Committee (SANC) and may also nominate members as Chairmen of the SATC's in which the AMEU is represented.

Plenary sessions of the IEC (Internation Electrotechnical Com-

mission) take place annually and the 1986 session held in Berlin, was attended on behalf of the AMEU by Messrs. Loubser, President and E de C Pretorius, as part of the South African contingent headed by the SABS.

Progress reports of the IEC TC's are contained in the main report of the SABS Co-ordinating Committee.

*J K VON AHLFTEN*  
Representative

#### **DR JOHNSON: SA NATIONAL COMMITTEE OF THE IEC:**

First of all perhaps in my capacity as President of the South African National Committee of the IEC, it would first be appropriate for me to offer my congratulations to you and to the AMEU on this convention. I am sorry I did not get a chance to do this yesterday but, as I mentioned, I was busy trying to find out what happened to my colleague at the time - he is still in Pretoria.

I think everyone here knows very well what the IEC stands for and its role in international standardisation. What I would like to explain, is the official formation of the South African National Committee of the IEC.

The IEC as an international organisation, recognises member countries and each country is deemed to have a national committee, which is the mouthpiece of all that country's activities. Historically the SABS has effectively been that mouthpiece and has effectively in the past, served the purpose. We have informally obtained the options of the relevant organisations when necessary and we forwarded this information to the IEC.

We felt that it is now important to try and get this activity out

into the field where it really belongs, so that in future the views expressed by the South African National Committee, can really seem to be those of the people that have to use the International Standards. For this purpose we have now formally inaugurated the South African National Committee of the IEC.

The way it operates is described in the documentation you have and is reasonably straightforward. We have a number of technical committees that are in correspondence with the International Technical Committees. The Chairman of these committees, wherever possible are from outside the Bureau of Standards. The Bureau provides a secretarial function and the Chairman of each of these committees in turn form the South African National Committee.

I think that is all I really need to say. The rest is spelt out in the documentation. It may not read as easily as we would like it. We are still trying to get that into shape but, perhaps if there are any questions, I will be happy to answer them. Thank you.

#### **PRESIDENT:**

Thank you Dr Johnson. Are there any questions, or any contributions.

in that the directors of the EDF are responsible for all power generation, transmission, distribution and supply to all consumers including the smallest domestic consumer. This has placed the EF in a position to rationalise the use of major items of plant. For example while medium and high voltage switchgear is still developing along independent directions worldwide, viz. small oil volume (SOV), vacuum and airblast, and sulphur hexafluoride (SF<sub>6</sub>), the EDF has standardised on the latter and France only manufactures this class of switchgear for the EDF. In contrast, in the UK, the Area Boards each decide independently on the type of switchgear to use. France has also standardised on the use of cross-linked polyethylene (XLP) cable and does not use paper oil insulated cable.

South Africa, with its limited market, could possibly benefit from the rationalisation introduced by the EDF.

On his return from the Symposium, the City Electrical Engineer of Johannesburg stopped over in London for a meeting with British Electricity International (BEI) and was also able to have discussions with members of the Area Boards. Of particular interest was the most recent development in the manufacture of non-flammable transformers for installation in buildings, particularly of the high-rise type.

The benefits derived from the one week visit cannot be quantified but the extensive knowledge gained of current practices and policies of the overseas supply industry over a wide spectrum, from technology to management, will enable a thorough evaluation of South African practices to be made with a view to future planning.

Attached as Annexure B is a list of the documentation handled at the symposium. This literature will be retained in the Electricity Department Library for use by electrical engineers within the Department as well as other local authorities.

**ANNEXURE A**

#### **SYMPOSIUM PROGRAMME**

**MONDAY 2 DECEMBER 1985**

#### **Protection Trends, New Generation Equipment**

- General, basic functions
- Protective relay technology

## **REPORT ON INTERNATIONAL SYMPOSIUM ON THE DISTRIBUTION OF ELECTRICAL ENERGY IN URBAN AND RURAL AREAS**

**PARIS: 2 - 7 DECEMBER 1985**

The Symposium and Exhibition was attended by delegates from 50 different countries who, in general to a greater or lesser extent, import electrical equipment from France.

Attending from South Africa were the City Electrical Engineers of Johannesburg and Cape Town, Messrs W Barnard and D C Palser respectively, both of whom were treated with the utmost courtesy and friendliness by all local officials and delegates.

As is evident from the Symposium Programme set out in Annexure A to this report, many technical papers were presented, details of which are available to interested parties.

In general, the subjects dealt entirely with medium and low voltage systems with the emphasis more on small rural reticulations than on high density industrial supplies. Nevertheless, because of the manner of presentation and opportunities afforded for questions and discussion, much valuable information was gained.

The South African delegates were also able to contribute to the discussion and it was evident to all that, in many cases, technological development in South Africa is equally advanced to that in France. French manufacturers, anxious to broaden their South African market, were advised that local manufacturing facilities were essential as local content is of major importance.

At meetings with senior engineers of Electricité de France (EDF), a wide range of interesting matters, including top management structures and technical and research developments, were discussed and proved of considerable value.

The control of the electricity supply industry in France is unique

Protective devices with no auxiliary source  
Integrated protection systems

#### **Role of Telecontrol Equipment and Systems Case Histories**

Telecontrolled plant and networks  
Role of telecontrol  
Equipment and Systems:  
HV/MV and MV/LV substations  
Telecommunications  
Control Centres  
Case Histories

#### **Means of Improving Quality of Service on Existing Networks**

Network refurbishment  
Examples  
Improved quality of service and increased network capacity  
Increased supply capacity  
Modifications to existing network  
Auto-transformers to maintain voltage level  
Refurbishment of MV and LV system

### **TUESDAY 3 DECEMBER 1985**

#### **Trends in MV/LV Substation Design and Equipment**

Trends in MV/LV substation design  
Trends in MV switchgear  
Trends in MV/LV transformers

#### **News in Brief**

Bleeding electricity from HV lines  
Electric power for heat generators

#### **Unbalanced Conditions of Rural Networks**

Control of unbalanced operation in rural areas, thermal  
image protection

#### **LV Consumer Protection and Associated Distribution System**

General considerations on public distribution  
Neutral connections on LV public distribution  
Earth leakage circuit breakers for protection against injury  
and damage  
Technology of protective equipment

### **WEDNESDAY 4 DECEMBER 1985**

All day visit to specific panels of interest on the stands of the 3rd  
International Electrical Equipment Exhibition Paris.

### **THURSDAY 5 DECEMBER 1985**

#### **Morning**

Visit to limited specific exhibits for more detailed discussions.

#### **Afternoon**

Visit to the Planning and Research Section of EDF where  
20 000 engineers and technicians are employed and extensive  
use is made of sophisticated computer facilities.

### **FRIDAY 6 DECEMBER 1985**

Visit to a major EDF Distribution Control Centre at Nogent Sur  
Oise some 160 km north of Paris where modern solid state tele-  
control equipment with colour graphic displays were being in-  
stalled.

#### **ANNEXURE B**

#### **ELECTRICITY DEPARTMENT**

#### **INTERNATIONAL SYMPOSIUM ON THE DISTRIBUTION OF ELECTRICAL ENERGY IN URBAN AND RURAL AREAS**

#### **INDEX OF LITERATURE (FILED IN ELECTRICITY DEPARTMENT LIBRARY)**

1. French distribution systems design and construction practice by G Gallet.
2. Marginal cost pricing: updating the French electricity tariffs to reflect changes in the characteristics of the supply-demand system by M Francony, B Lescoeur - Ph. Penz.
3. The bases of load management.
4. The standardization at 20 kV of the E.D.F. distribution voltage by Jacques Schmeltz.
5. The power system studies service:
  - Its aims its activities
  - Its organisation
  - Its means
6. Power system studies service.
7. Power system networks analysis, aim and methodology by M Paul Auges and M Gérard Pioget.
8. Present and future trends in French distribution system practice by R A Teller.
9. C.1. Distribution System.
  - C.1.1. Choice of basic engineering features of distribution systems.
  - C.1.2. HV/MV substations.
  - C.1.3. Underground MV network configurations.
  - C.1.4. Structure of MV overhead networks.
  - C.1.5. System protection.
  - C.1.6. Automated devices for the operation of distribution networks.
10. C.2. Power distribution in medium voltage.
  - C.2.1. Introduction
  - C.2.2. Equipment of distribution substations.
  - C.2.3. Distribution transformers.
  - C.2.4. Power capacitors
  - C.2.5. Bare conductors overhead lines.
  - C.2.6. MV Distribution cables.
  - C.2.7. Connection hardware.
  - C.2.8. Public distribution substations.
  - C.2.9. Conclusion.
11. C.3. Public low voltage distribution.
  - C.3.1. Introduction.
  - C.3.2. Low voltage rural systems structure, protection and service connections.
  - C.3.3. Low voltage urban systems general description.
  - C.3.4. LV domestic consumer protection and associated distribution systems.
  - C.3.5. The LV consumer board.
12. Distribution of electric energy in urban and rural areas.
  - C.1. Protection trends - new generations of protective devices.
  - C.2. Power distribution system control.
  - C.3. Means of improving the quality of service on existing networks.
  - C.4. Trends in MV/LV switching stations.
  - C.5. Unbalanced conditions of rural networks.
  - C.6. LV Domestic consumer protection and associated distribution systems.

*W BARNARD  
Representative*

## MR W BARNARD: ELECTRICITY CONTROL BOARD

Mr President, actually Mr Palser and I attended this symposium in Paris. The point I meant to make is that we had the opportunity of having fairly detailed discussions with Electricity De France and, we did find that they had not so much standardised but they had in fact rationalised the use of electrical equipment and plant throughout the industry right through from generation to the smallest consumer.

The reports that we had to submit were sent to the Province and my Council also sent it to the Electricity Control Board, who had a meeting in February to discuss them. As a result of this they submitted a report to Minister Danie Steyn and just before I left, they sent a copy of this report to me with the comment that the Minister had agreed to implementing certain proposals. The proposal is to establish a steering committee that will look at the electrical industry and the plant being used right across the board and to rationalise the industry to some extent.

I have been nominated to chair the steering committee as it is first of all established with the object of possibly forming working groups. I think it might be of interest to you to know that the brief says to request all interested parties to meet with the object of exchanging ideas, after which a decision can be taken as to further action.

Organisations that can be invited to take part in the initial discussion are Eskom, the Council of Scientific and Industrial Research, the SABS, the AMEU, the UME, various manufacturers, Chamber of Mines and the South African Transport Services.

I am just mentioning this at this stage. Ek dink veral die VMEO moet besin hieroor sodat hulle op hierdie stadium reeds kan besluit wie hulle gaan aanwys om op hierdie komitee te dien. Dankie mnr die President.

## PRESIDENT:

Dankie mnr Barnard. Met ander woorde u maak nou die voorstel dat die VMEO 'n verteenwoordiger moet aanwys. Is dit reg mnr Barnard?

## MR MAX CLARKE: RANDBURG

I am sorry that Mr Piet Botes is not here because this matter was discussed, or I assume it was discussed at the last Electricity Supply Committee meeting. I am just wondering if there are going to be two committees or whether it is the same committee that Eskom are looking at with virtually the same objectives.

## MR W BARNARD: ELECTRICITY CONTROL BOARD

In fact it is the same committee and I have already had discussions with Eddie Ralph of Eskom, who was I think chairing this committee, but the brief came from the Electricity Control Board and the Department of Energy and they have now asked me to do the original co-ordinating. But I certainly do not plan to be actively involved after that.

## MR MAX CLARKE: RANDBURG

Mr President, I can inform you, and this meeting, that this will be discussed at the Executive Council Meeting on Thursday. In the minutes of the Electricity Supply Committee you will note that there is reference to this particular matter, with a recommendation of who should be the representatives from the AMEU.

## PRESIDENT:

So this matter will be cleared up at the Executive Council meeting.

## VERSLAG: INTERNASIONALE ELEKTROTEGNIESE KOMMISSIE (I.E.K.)

Bogenoemde vergadering is gehou in Wes-Berlyn van 1 tot 9 Oktober 1986. Die Suid-Afrikaanse afvaardiging het bestaan uit die volgende lede:-

- Dr C Johnston, S.A.B.S. (Leier).
- Mnr I Kruger, S.A.B.S.
- Mnr R Filippini, S.A.B.S.
- Mnr E de C Pretorius, V.M.E.O.
- Mnr J A Loubser, V.M.E.O.
- Mnr G D Bishop, Tedalex.

Die vergadering is bygewoon deur 36 I.E.K. lidlande uit die totaal van 42.

Die V.M.E.O. afvaardiging het die vergaderings van die komitees belas met Grafiese Simbole en Ontvangstoestelle bygewoon en alhoewel die vergaderings baie interessant was, het die klem hoofsaaklik op Elektronika gelê.

Verder het die afvaardiging ook die Komitee van Aksie en dié van die Raad bygewoon. Tydens laasgenoemde het Dr. Eicher, Sekretaris-Generaal van die Internasionale Standaard-Organisasie die vergadering toegesprek oor "Nuwer Samewerking tussen die I.E.K. en I.S.O."

Mnr. G R C Mc Dowell van die V.K. is ook op die vergadering verkies tot nuwe President van die I.E.K.

Sekere lande se tydperk op die Komitee van Aksie nl. Sjina, Italië, V.K. en Joegoeslawië is verstreke en in hulle plek is die volgende lande verkies: Australië, Frankryk, Nederland en Rusland.

Die 51e (1987) Algemene Vergadering van die I.E.K. word gehou in Praag, in Julie 1987. Vir die 52e (1988) Algemene Vergadering is daar 'n uitnodiging ontvang van Australië/Nieu-See-

land sowel as Turkye; die aangeleentheid is verwys na die Algemene Beleidskomitee wat in Januarie 1987 'n besluit moet neem watter een van die twee uitnodigings aanvaar word.

Die V.M.E.O. afvaardiging het ook van die geleentheid gebruik gemaak om saam tegniese besoeke mee te maak wat baie interessant was. Een so 'n besoek was aan die fabriek van een van die grootste elektriese maatskappye in Duitsland; dit was 'n riem onder die hart om te ervaar dat daar nog soveel welwillendheid teenoor Suid-Afrika is van so 'n wêreldreus.

Wat die sosiale sy betref, was daar genoegsame voorsiening. By hierdie geleentheid het ons, ons kans waargeneem om die verwronge (en soms lagwekkende) beeld van die Suid-Afrikaanse situasies in die regte perspektief te stel.

Alhoewel die Komitees wat tydens hierdie I.E.K. vergadering bygeekom het, nie van sulke direkte belang vir die V.M.E.O. was nie, word daar gevoel dat die persoonlike gesprekke met ander lede van soveel waarde was dat daaraan gedink moet word om selfs meer V.M.E.O. lede af te vaardig om as Ambassadeurs vir ons land op te tree.

Die afvaardiging is baie dank verskuldig vir die geleentheid om die vergadering te kon bywoon. Dit was voorwaar 'n groot voorreg!

J A LOUBSER  
Verteenwoordiger

## MR JA LOUBSER: BENONI

Mnr die President, eintlik wil ek net om verskoning vra vir so 'n effense misverstand.

Die voordeel wat 'n President het is dat hy kan deleger en ek het die skryf van 'n verslag hieroor destyds aan mnr Pretorius gedelegeer, en hy het dit baie goed gedoen. Maar toe hy uitree toe kry ek 'n versoek vir 'n verslag en ek haal hom toe maar weer woordeliks aan. Nou verskyn altnoe verslag en hulle is amper identies. So ek wil net verskoning vra daarvoor mnr die President. Dankie.

## STATUS OF THE TOWN ELECTRICAL ENGINEER: REPORT

During the Executive Council Meeting held during October 1985, it was resolved to nominate a Committee to investigate the status of the Town Electrical Engineer.

The Committee consisted of Messrs. D C Palser, W Barnard and J A Loubser. As a result of the retirement of Messrs. Palser and Barnard, Dr. N Botha and Mr. E G Davies were later appointed to serve on the Committee.

Initially a letter with a memorandum was addressed to the President of the United Municipal Executive wherein he was requested to convene a meeting to discuss the problem.

In reply to the above, the undersigned only received a telephone call from the Secretary of the U.M.E. in which he maintained that he personally agreed with the contents of the memorandum but as the U.M.E. is the body who is responsible for the position of the Town Electrical Engineer relatively to that of other Municipal personnel, they are to take no action, not even reply to our letter.

Meanwhile, two of our members viz. Mr. Ken Murphy of Somerset West and Mr. Enslin Naude of Carletonville furnished us with more ammunition which could assist us in our struggle for more recognition. These reports were considered at our last meeting held on 10th June, 1987, when it was resolved to convene with the Institute of Municipal Engineers as well as to address a letter to the Minister concerned. At the time of compiling this report, these resolutions have not as yet been implemented.

A factor which could also contribute to improvement of the situation is the probability of a name change. Information in this regard has been received from our own Legal Advisor and will be discussed at our next Executive Meeting.

## STATUS VAN DIE ELEKTROTEGNIËSE STADSINGENIEUR: VERSLAG

Tydens die Uitvoerende Raadsvergadering wat gehou is in Oktober 1985 is daar besluit om 'n Komitee te benoem teneinde die status van die Elektrotegniese Stadsingenieur te ondersoek.

Die Komitee het bestaan uit mnr. D C Palser, W Barnard en J A Loubser. As gevolg van die uitrede van mnr. Palser en Barnard is dr. N Botha en mnr. E G Davies later benoem om ook op die Komitee te dien.

Ter aanvang is 'n brief met 'n memorandum aan die President van die Verenigde Munisipale Bestuur gerig waarin gevra is dat daar 'n vergadering belê moet word waartydens die probleme bespreek kan word.

In antwoord hierop het die ondergetekende slegs 'n telefoonoproep van die Sekretaris van die V.M.B. ontvang waarin hy gesê het dat hy persoonlik saamstem met wat daar in die memorandum gesê is maar aangesien die V.M.B. die liggaam is wat verantwoordelik is vir die posisie wat die elektrotegniese stadsingenieur beklee relatief tot die ander munisipale personeel hulle niks daaromtrent gaan doen nie, ook nie eens antwoord op die brief nie.

Intussen het twee van ons lede te wete mnr. Ken Murphy van Somerset-Wes en mnr. Enslin Naude van Carletonville ons van addisionele skietgoed voorsien wat baie handig te pas kom in ons stryd om meer erkenning. Hierdie verslag is tydens ons laaste vergadering gehou op 10 Junie 1987 oorweeg en daar is besluit om in gesprek te gaan met die Instituut van Munisipale Ingenieurs asook 'n skrywe te rig aan die betrokke Minister. Ten tye van die opstel van hierdie verslag is hierdie besluite egter nog nie uitgevoer nie.

'n Faktor wat ook moontlik kan bydra tot die verbetering van die toestand is die moontlikheid van naamsverandering. Inligting in dié verband is van ons eie Raadsadviseur ontvang en sal op die eerskomende Uitvoerende Raadsvergadering bespreek word.

J A LOUBSER  
Convenor/Saamroeper

### PRESIDENT:

Dit is 'n baie belangrike item en verslag oor die status van die Elektrotegniese Stadsingenieur. Mnr Loubser sal u praat asseblief.

### MNR JA LOUBSER: BENONI

Sedert die verslag geskryf is het daar heelwat korrespondensie in hierdie verband plaasgevind. Onder andere twee skrywes aan Minister Heunis in verband met amptelike erkenning, en 'n skrywe aan die Munisipale Vereniging van Transvaal en ook 'n brief aan die Instituut van Munisipale Ingenieurs met die moontlikheid van 'n naamsverandering. Ek het nog net eintlik erkenning van ontvangings gekry. Behalwe vir die Munisipale Vereniging van Transvaal waar ek ook 'n telefoonoproep gekry het en dit lyk vir my baie meer positief as wat dit was in die verlede. Verder het ek nie kommentaar nie mnr die President.

### DR NICO BOTHA: BLOEMFONTEIN

Ek wonder, in sy vorige verslag sien ek mnr Loubser sê, wat amptelike erkenning aanbetref is daar genoegsaam voorsien, of kan hy dit verduidelik.

Wat die item self aanbetref, baie dankie mnr Loubser vir 'n baie goeie verslag. Ek wil net graag 'n gedagte by u laat. U weet dat Wet 91 van 1983, dit is die Wet op Plaaslike Owerheidsaangeleenthede, maak onder andere voorsiening waar daar erkenning gegee word vir Institute en ek wil maar net kortliks vir u sê, ex-officio is daar 'n klomp Direkteur-Generale en Ministers

wat daarop dien. Maar my versoek aan u is, daar is ook aangeselde lede. So byvoorbeeld is daar twaalf lede van die VMB, daar is van die Instituut van Stadslerke, die Instituut van Rekenmeesters en so aan.

Onder andere maak hierdie Wet ook voorsiening dat die Minister enige persoon kan ko-opteer of enige liggaam ko-opteer wat 'n wesenlike bydrae kan lewer. Ek maak die bewering dat hierdie Vereniging 'n wesenlike bydrae kan lewer en ek wil mnr Loubser versoek, omdat hy so nou saamwerk met Minister Heunis, of hy nie ons Vereniging ook kan betrek op hierdie Koördineringskomitee nie. Dankie.

### MNR JA LOUBSER: BENONI

Mnr President, ek het gesê daar is twee verslae en twee briewe geskryf aan die betrokke Minister. Die een is juis oor amptelike erkenning waarvan Dr Botha nou gepraat het, en die ander een is oor verteenwoordiging op die Nasionale Opleidingskomitee. Dit is die twee sake wat aan die Minister geopper was.

### PRESIDENT:

Met ander woorde die saak geniet wel aandag. Dankie mnr Loubser. Mnr Enslin Naude u wil graag iets sê omtrent die verslag.

### MNR NAUDE: CARLETONVILLE

Mnr die President, ek wil net graag byvoeg by wat mnr Loubser in sy verslag gesê het, en dit is soos u en die lede van die



Hoëveldtak weat, 'n punt wat baie naby aan my hart is. Solank as wat ek asem in my longe het sal ek hierdie saak baklei met alles wat ek het.

Mnr die President, vergun my egter net om 'n klein bydrae te maak. U weet toe ek met hierdie saak begin het omtrent twee jaar terug, het van die ouer lede vir my gesê, "Jong, is jy nie besig om slapende honde wakker te maak nie." En u sal onthou wat ek geantwoord het. "Die idee is nie om die slapende hond wakker te maak nie, die idee is om die slapende hond aan sy stert te gryp en hom in die maag te skop en hom in die rivier te gooi." Ek wil vandag hier by die hele vergadering 'n beroep op elke ingenieurslid doen. Hierdie saak van die status van die Elektrotegniese Stadsingenieur kan nie by een of twee mense tuis hoort nie. Mnr Loubser kan nie alleen baklei nie. Ons kan nie 'n klein groepie wees wat saam werk aan die status van die Elektrotegniese Stadsingenieur nie. Ons moet elkeen wat hier is, sy eie bydrae lewer in sy eie Stadsraad.

Jy weet, toe ek vir die eerste keer in 'n Raadsvergadering verwy het na die Siviële Stadsingenieur, het mense my aangekyk asof die kat my ingedra het. Twee jaar later stel die Stadsingenieur homself voor as die Siviële Stadsingenieur in my teenwoordigheid, wat beteken het ons bereik iets, ons kom iewers. Maar mnr die President ek herhaal, dit kan nie van een of twee mense kom nie. Dit moet by elke persoon in hierdie kongres, elke ingenieurslid van die VMEQ, daardie trots wees dat ek kan sê, "Ek is 'n Elektrotegniese Stadsingenieur, ek is nie skaam vir my beroep nie."

Ek sal enige tyd my mede professione, wat ek nie wil afkraak nie, in teendeel, ek glo dit is baie noodsaaklik dat die ingenieurs dissiplines saam moet werk, maar ek gaan vir geen oomblik terug staan en sê ek is jammer ek lewe nie.

U weet toe ek op Pretoria studeer het, het my professor, ek sal nie sy naam noem nie, vir my gesê, "Jy weet Enslin, 'n ingenieur is soos 'n onderwyser, hy moet dit doen vir die liefde van die saak. Hy behoort nie eens betaling te kry nie. Hy moet dit doen soos 'n maatskaplike werksker - 'n beroep wat ek baie groot respek voor het - maar hy moet dit doen asof hy goed voel daaroor. Miskien R500 per maand kry sodat hy darem kos kan koop."

Mnr President daardie dae is verby. Daardie dae is vir ewig verby. Ons as ingenieurslede, Elektrotegniese Ingenieurslede, moet vir hierdie land van ons wys (a) ons is onmisbaar, en ons is onmisbaar, en (b) dat ons 'n beroep gekies het wat nie een van daardie dissiplines eers naby kan kom nie. Verstaan my mooi, ek kraak geensins die ander dissiplines af.

Mnr die President ek sal dit vir u sê. Dit is darem baie makliker om 'n pad te bou as om 'n substasie te ontwerp, en ek wil 'n derde keer 'n beroep maak, as ons nie in ons self daardie trots laat uitgloei nie, daardie gevoel kry, en as jy in 'n vergadering is moet ek ook daer wees jy is die Elektrotegniese Ingenieur. Sonder om te spog daaroor, sonder om groot te praat daaroor, maar ons as Elektrotegniese Ingenieurs, die dae dat ons 'n guns vir die samelewing bewys het, is verby.

Vandag moet ons hierdie land van ons wys dat ons onmisbaar is. Daardie Wet wat Dr Botha na verwy het is vir my 'n pragtige voorbeeld. Ons het daardie saak op ons tak ook behandel. Al die institute is daar verteenwoordig. Selfs die instituut vir sogenaamde Munisipale Ingenieurs. En ek kraak hulle nie af nie. Ek sê net hulle het die kat bietjie aan die stert beet om te verwy na Ingenieurs.

In my Raad het die Voorsitter van die Bestuurskomitee verwy na die Ingenieur. Dan moet almal wees by verwy na die Siviële Ingenieur tot hy eenmaal vir my gevra het wat sê die Ingenieur. Hy het na 'n siviële projek verwy. Toe sê ek, "Nee mnr die Voorsitter, ek weet nie, u is u nie my kollegas vra nie?" Met ander woorde wat ek probeer sê is, die dae van Ingenieurs en elektrisiteit is ook verby. Ons is nou die elektrotegniese Ingenieurs en nie Siviële Ingenieurs.

Mnr die President, ek sluit af met 'n baie sterk gevoel in my hart dat ek hoop dat hierdie kuiken wat gebore is, sal groot word in 'n baie sterk hoender wat sal baklei vir elke reg en voorreg wat ons ingenieursprofesie in hierdie land behoort te hê. Baie dankie.

## PRESIDENT:

Dankie mnr Naude. U het mnr Naude se pleidooi gehoor en ek dink ons stem eintlik almal saam met hom. Dit is natuurlik so dat die kwessie van 'n naam, byvoorbeeld ons praat nou van die naam van die Siviële Stadsingenieur, ek glo nie dit is enigsnis 'n afkraking van die amp van 'n Stadsingenieur as by Siviële Stadsingenieur genoem word nie. Lijk vir my al wat dit eintlik is, is dat dit histories geskiedkundig 'n naam is wat al jare saam gekom het met die spesifieke amp van Siviële Stadsingenieur en dit lyk vir my dit is die groot probleem. So ek dink mettertyd sal dit dalk inslag kry, en inslag vind dat dit wel kan verander. Dankie mnr Naude. Is daar enige verdere bydrae?

## MNR K MURPHY: SOMERSET WES

Mnr die President in die Goëie Hoop Tak, samehangend met die aspek wat u nou bespreek het, is die kwessie van die salaris van ingenieurs in kleiner dorpe bespreek, en daar is kommer oor die situasie wat ontstaan met die Wet op Stadsklerke wat bepaal dat hy die hoogste besoldigde persoon moet wees in die Raad, en dat daar dan die kwessie is van 'n ingenieur wat sekere kwalifikasies en verantwoordelikhede moet hê en nogtans is daar geen bepaling van kwalifikasies vir die Stadsklerk as sulks nie. Ek noem dit net vir u want dit is samehangend met die aspek wat u so pas bespreek het. Dit wil vir my voorkom of die saak dalk in die toekoms reg sal kom. Dankie.

## RDL HENRY BARNARD: BRAKPAN

Mnr die President weat ek stem heeltemal saam met wat Enslin, en ek glo nie hy sal omgee as ek hom so noem nie, nou gesê het. Ek hou van sy gevoel. Ek hou daarvan dat 'n man moet opstaan vir sy regte. Ek was nog altyd iemand wat gesê het dat in 'n groot mate moet die Elektrotegniese Ingenieurs hulle self blameer vir die situasie waarin hulle verkeer.

En ek sê dit nie om met julle te baklei nie, ek sê dit omdat ek gevind het dat die Elektrotegniese Ingenieurs verrig wondere, maar wanneer dit kom by 'n bietjie publisiteit, dan hardloop hulle almal weg. Ek dink julle moet na vore kom en die mense laat besef dat daar bestaan sulke goeie Siviële Elektrotegniese Ingenieurs. Kom na vore, sê vir die mense, dat hulle weet. Sê dit aan die media, sê dit waar julle lus het om dit te sê.

Die ander saak wat vir my nie heeltemal duidelik is nie maar wat ek dink ek verstaan is dat by Stadsrade self is daar nie probleme op die status basis in die Stadsraad self nie. Ek dink miskien daarbuite, want as dit kom op die verandering van 'n naam in 'n Stadsraad self dan glo ek dit is nie 'n probleem nie. Die Stadsrade behoort net die saak te verander, want elektriese ingenieurs is op 'n gelyke basis met die Stadsingenieur. Hulle is op dieselfde salarisskaal, alle omstandighede is dieselfde en ek wil op hierdie stadium onderneem, dat as dit van 'n naamsverandering afhang, om die saak reg te stel, ek sal teruggaan en dit met my Stadsklerk bespreek en kyk of ons die saak kan regstel. Naamlik dat jy 'n Stadslektrotegniese Ingenieur heet, afhangende van watter een vir die VMEQ aanvaarbaar is. Wat die ander saak betref kan u ook verkeer wees, dat as ek 'n bydrae kan lewer kan u op my knoppie druk. Dankie.

## PRESIDENT:

Dankie rdl Barnard.

## MNR HUNT: WHITERIVER

I just want to offer one important concept. For years we have been subjected to the propaganda that there is a shortage of Engineers. I think we should twist this propaganda around to our advantage and make it quite clear that there is no shortage of Engineers, but that there is a shortage of people who are fit to employ Engineers. Thank you.

## RAADSLID VAN VUUREN: PIETERSBURG

Mnr die President, die opmerking is deur mnr Naude gemaak dat sy professor vir hom gesê het, hy en die onderwyser is min of meer dieselfde. Op die ou end het ons ook gehoor van die kleiner plaaslike owerhede wat probleme het om ingenieurs te werf. Miskien het hulle vroeër jare, in die tyd van mnr Enslin se

professor, nader aan die hemel geleef as wat ons leef. Maar ons leef in 'n tyd waar ons moet besef dat ingenieurs en onderwysers en die professionele mense nie op die aarde kan preek en die hemel kan annekseer nie. Baie dankie.

#### PRESIDENT:

Dankie Raadslid. Is daar nog bydraes asseblief. Dit is 'n belangrike aspek vir ons Elektrotegniese Stadsingenieurs.

## TRAINING COUNCIL: LOCAL GOVERNMENT TRAINING ACT, NO. 41 of 1985: REPORT

In terms of the Local Government Training Act the Government established a National Co-ordinating Training Committee with Regional Training Committees in the four provinces and one or more regional sub-committees in each of the provinces.

The President of the AMEU was invited to sit on the National Co-ordinating Training Committee and the AMEU appointed representatives to the various regional committees and sub-committees.

The original appointments were as follows:-

Transvaal	
Regional Committee	: J A Loubser of Benoni
Regional sub-committees	: A H L Fortmann of Boksburg E de C Pretorius of Potchefstroom J E Heydenrych of Middelburg J van P Lochner of Pietersburg
Orange Free State	
Regional Committee	: N S Botha of Bloemfontein
Regional sub-committees	: To be appointed by N S Botha if required
Natal	
Regional Committee	: E G Davies of Pietermaritzburg
Regional sub-committees	: To be appointed by E G Davies when required
Cape Province	
Regional Committee	: J D Dawson of Uitenhage
Regional sub-committees	
In the Western Cape	: D C Palser of Cape Town
In the Eastern Cape	: I L Hobbs of Uitenhage

#### MR JD DAWSON: UITENHAGE

Mr President, when I wrote this report on behalf of the then President of the AMEU, Mr Loubser, I was under the impression that the President of the AMEU had been invited to sit on the National Co-ordinating Training Committee, but I am informed that this was not so. In view of the major contribution that the President of the AMEU could make to the work of the National Committee, this omission is regretted and it is to be hoped that it will be corrected in the future.

Now a few minutes ago Mr Loubser told the meeting that he had

Alternatives were provided for the above appointments and during the period 1985 to 1987 a number of appointments and changes of appointments were made to the various committees.

The system was designed to operate with frequent meetings of the regional sub-committees who would be responsible for implementing the Act at local level and reports would be made by them to the regional committees who would meet infrequently or as and when required.

As convener of the Technical Training Committee I was instructed by the Executive Council at its meeting held on the 19th March, 1987 to collate the various reports from the regional representatives and to summarise these in this report.

Judging by the reports submitted to me there have been many meetings of the various committees and sub-committees but it would appear that to date progress has been limited to discussion on how to implement the proposals contained in the Act and this has been difficult because of many problems ascribed mainly to the complexity and scope of the set task.

In order to achieve the objectives visualised in the Act it may therefore be necessary to limit the application of the Act to specific projects and it is for this reason that the AMEU accepted the invitation from the National Co-ordinating Training Committee to submit proposals to them specifying the minimum standards for the acceptance of Municipal Technical Training Centres and the subsidising of apprentices attending these centres.

It is to be hoped that the regional training committees and sub-committees will be able to make progress with the preparation and planning work so that more tangible results can be reported to the next convention.

J D DAWSON  
Convener

written to the Minister about this, which is more than good, but I think that the Executive Council that is meeting on Thursday, should look for ways and means that the application Mr Loubser has made, can be supported and I suggest that you give it some deep thought because it is very important.

Apart from this, I have nothing further to add to the report but, I am sure that the AMEU representatives in the Regional Sub-committees would be able, if requested, to comment in more detail on the activities of the various Regional Sub-committees.

Thank you Mr President.

# ACKNOWLEDGEMENTS AND CLOSING OF THE CONVENTION BEDANKINGSWOORD EN AFSLUITING VAN DIE KONVENSIE

AHL Fortmann: President

## PRESIDENT

Dames en Here ek is bly dat die Burgermeesters, Raadsheer Muller en ons Burgermeester, Raadslid Piet Buckle en die Burgermeestersgades en al die ander dames weer by ons kon aansluit.

In die heel eerste plek wil ek ons Burgermeester van Boksburg, Raadslid Buckle vra om namens Boksburg 'n paar woorde te sê.

## BURGERMEESTER, RAADSLID JP BUCKLE: BOKSBURG

Meneer die President, Raadsheer Muller, Burgemeester van Kaapstad, eregaste, dames en here. Dit is vir my 'n besondere voorreg vanmiddag om namens ons Stadsraad baie dankie te sê.

U weet ek voel partykeer soos die student wat aan die begin van die jaar by die Universiteit ingeskryf het en toe na die eerste lesing van sy Professor toe net eenvoudig weggeby het. En hier aan die einde van die jaar kom hy toe, na die Professor en sê hy wil nou inskryf vir die eksamens. Die Professor sê vir hom nee, ek sal jou glad nie toelaat nie, dit is onmoontlik, want ek laat nie 'n man in my vak inskryf nie wat niks weet nie. 'n Lang rede-nasie met die Professor het hulle hom toegelaat om te skrywe. Nadat hy geskrywe het, kry die betrokke student 99% in die vak. Die professor roep hom toe en hy sê: "Man ek kan dit nie verstaan nie, jy het nooit 'n klas bygewoon nie en jy kry 99%." "Ja Professor sê hy ek moes eintlik 100% gekry het, maar jy het my deurmekaar gemaak met jou eerste lesing."

Ek wil graag baie, baie dankie sê aan Raadsheer Muller en die Stadsraad van Kaapstad vir hierdie wonderlike ontvangs wat hulle ons, almal hier gebied het. Ek kan vir u sê hulle harte klop baie warmer as hulle seewater, want dit is 'n bietjie koud vir ons Transvalers. Baie, baie dankie daarvoor en ek wil ook vir u dankie sê, u weet wat ons nie hier kan verstaan nie, is dat as ons 'n koeldrank hier wil hê dan moet ons betaal, maar as ons wyn wil hê dan kry ons dit verniet. Daar bo is dit nou net mooi anders om.

Die dominee het ook maar sy besoek gedoen en toe hy by een van sy kerksraadslede kom toe drink hy ook so 'n bietjie van hierdie "Peach Brandy" en hy sê vir hom, "maar kan ek ook nie bietjie van hierdie brandewyn kry nie?" Hy sê ja Dominee, "I'll give it to you on one condition, on Sunday morning from the pulpit you thank me for it." Hy het toe ook maar sy woord gestand gedoen en die oggend kom die Predikant en hy sê, "I want to thank my Elder for the Liquid fruit that he has sent me and especially the spirit in which it was sent."

Ons is baie, baie dankbaar vir die ontvangs wat ons hier gehad het en ons sal in die Noorde, waar heen ons terug gaan, altyd terug dink aan die goeie behandeling en die baie vriendelike mense wat ons hier kry. U weet dit is vir ons opvallend dat wanneer ons selfs hier in die straat loop, dat almal mekaar groet. Of hulle jou nou ken en of nie, hulle groet jou, en dit is nogal 'n blyke van goeie inbors, en dit is vir my baie opvallend. Ek wil vir u sê, ons sal u onthou vir wat u gedoen het.

Ook wil ek baie dankie sê aan ons President wat hier verkies is. Alwin ons is baie trots op jou en op Joy, dat julle in die twee jaar wat nou voorlê die leiding gaan neem. Ook wil ek vir jou baie dankie sê vir die manier waarop jy hierdie groot kongres, gelei het. Ek wil vir jou sê, jy kan dankie sê dit is nie 'n politieke vergadering nie. Maar dit wys vir jou die mooi gesindheid van die afgevaardigdes wat vandag hier is.

Ek wil vir u toewens, God's rykste seën aan u wanneer u nou terug gaan, mag u veilig by die huis aankom en aan diegene wat

Natal toe gaan, wil ek sê, ons voel saam met julle met die groot probleme wat daar is, en ons vertrou dat ook daar, redding sal kom. Baie, baie dankie en tsiens.

## PRESIDENT:

Boksburg se Burgermeester het nou namens Boksburg dankie gesê aan Kaapstad. I will now call on Alderman Muller to say a word on behalf of the City of Cape Town.

## MAYOR, ALDERMAN PR MULLER: CAPE TOWN

Mnr die President en afgevaardigdes en mag ek sê vriende, want per slot van rekening nou die aand het my kollegas en ek die geleentheid gehad om met amper almal hier in die saal, persoonlike kontak op te neem. Dit was vir ons 'n groot voorreg om daardie kontak te maak. Dit was vir ons 'n groot voorreg dat u, u weg op gesien het, saam met die Stad Boksburg om hierdie konvensie, hierdie vergadering, hier in Kaapstad te hou.

Soos ek reeds aan die begin gesê het, dit het 16 jaar geneem sedert die laaste keer dat u Vereniging hier in die Moederstad byeengekom het om weer hier te wees en namens my Raad en veral my een kollega wat 'n professionele kollega van u is, Raadslid Van der Velde, wil ek u uitnooi om binnekort weer hier in die Moederstad te kom vergader. Ek hoop dit neem nie weer 16 jaar voor ons die voorreg sal geniet.

Friends could I just say, I do hope you enjoyed the time here. I know that elsewhere in the Country we've had a large natural tragedy and I think our thoughts go out to those parts of the Country, where in fact there has been loss of life and substantial loss of property.

We have been privileged in the last three days to enjoy some beautiful Cape weather. I hope that you have enjoyed the Cape hospitality and the Cape friendliness of spirit in all senses of that word, and I do hope that, as I said in Afrikaans, we will have the privilege of your company very, very shortly again here at the Cape of Good Hope. I thank you.

## PRESIDENT:

Thank you Alderman Muller for the closing address on behalf of Cape Town.

## PRESIDENT:

It is customary with the AMEU, it has been for many, many years, as long as I can recall, for someone to have a closing address on behalf of the affiliate members and a closing address on behalf of the ladies. Now first of all I would like to call on Mr Terence Marsh to deliver the closing address on behalf of the affiliates.

## MR TERENCE MARSH: HONORARY MEMBER (ON BEHALF OF THE AFFILIATES)

Mr President, His Worship the Mayor of Cape Town Alderman Muller, His Worship the Mayor of Boksburg Councillor Buckle, Honoured Guests, Ladies and Gentlemen.

First of all I wish to thank the AMEU for inviting me to reply on behalf of the Affiliates, I deem it an honour and a privilege.

By encouraging and allowing the Affiliates to take a more active role at Conventions, Technical and Branch Meetings, the Executive made us all aware of the need of close co-operation with one another.

# AMEU BURSARIES AND AWARDS



*His Worship the Mayor of Durban, Councillor Stanley H Lange, presenting the A.M.E.U. Award to the Best Qualifying Apprentice (Electrical) in 1986, Mr Alaric Ricardo da Silva.*

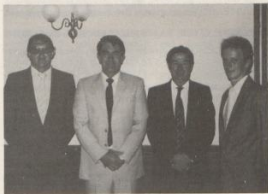
*The recipient selected, commenced duty in this Department on 1 March 1984 as an Apprentice (Electrician). Having obtained his NTC IV Certificate and on passing his Departmental Trade Test, he qualified as an Artisan (Electrician) in December 1986.*

*During his Apprenticeship he received training in Basic Tools, Overhead and Underground Mains, Electrical Workshops, Basic Electronics and Electricity, Tubing and Wiring, Heavy Current and House Services.*

*The method of selection was based on the percentage earned by the Apprentices on the progress reports which are completed by the heads of the various sections.*



*Mr H A Herberstein of the UCT receiving a full bursary for 1987 from Mr Ken Murphy, in the presence of Mr FLU Daniel.*



*The Technical Centre award for the year 1986 was split and awarded to 2 electrical apprentices in the Department of the City Electrical Engineer, Pietermaritzburg.*

*Gary David Rippon, aged 23 years, commenced a major apprenticeship on 20 January 1986. He has received high commendation in his weekly progress reports and in no case did he receive any adverse comment. In most cases progress was very good to excellent. Mr Rippon has completed N3 obtaining distinctions in 3 subjects averaging 90% and in the 4th subject obtaining a 76% pass.*

*Mr Greg Brian Sharp, aged 24 years, commenced a major apprenticeship on 1 April 1985. He has achieved the same standard in his progress reports and has also passed N4 with 3 distinctions averaging over 80% with a pass in the 4th subject.*

*The group photograph is showing the Mayor, City Electrical Engineer and the two recipients.*



*The award for the most deserving apprentice at the Cape Town Apprentice Training Centre, went to Mr J de Lange, a Cable Joiner apprentice who qualified by passing a compulsory Departmental trade test with a B+ symbol on his first attempt.*

*Mr de Lange is being presented with the A.M.E.U. award by Mr FLU Daniel, City Electrical Engineer, Cape Town.*



# VMEO BEURSE EN TOEKENNINGS



Raadslid Prof. Voet du Plessis oorhandig aan Vakleerling Hannes Maas die prys vir die mees verdienstelike student. Mnr Maas het tydens sy opleiding goeie leisterseinskappe getoon. Hy het die graad NS behaal en slaag sy vaktoets te Olifantsfontein met ses A-simbole met 'n gemiddeld van 91%.



Mr M S Bush receiving the award for the best Apprentice Electrician in the Apprentice Training Centre of the East London Municipal Electricity Undertaking, from Her Worship the Mayor of East London, Alderman Elsiebè Kemp.

## TEGNISE KOLLEGE WESTLAKE



Die oorhandiging van 'n tjek by die prysuitdelingsfunksie van 30 Julie 1987 was deur die voorsitter van die Kollege Raad, Mnr RD Smith, aan kwekeling GE de Jager van die Elektriese Afdeling gedoen.



Die jaarlikse prys vir die mees verdienstelike vakleerling wat gedurende 1986 sy opleiding aan die Roo-depoort Opleidingsentrum deurloop het is op Vrydag 11 September 1987 deur die President van die VMEO, mnr Jan Louber, oorhandig. Die suksesvolle kandidaat was Roelof A Pretorius wat op akademiese sowel as praktiese vlak uitsonderlik presteer het.

The AMEU provides a platform from which high level technical development – so difficult to keep pace with these days – can be disseminated to the membership as painlessly as possible, and in return we the Manufacturers, Suppliers and Consultants, are made aware of your demands in keeping abreast with the latest requirements in Municipal Undertaking Reticulation and control thereof.

Thanks to the understanding of the AMEU, we the Affiliates, now act autonomously in running our affairs, under the watchful eye of the Executive, of course, with whom we liaise closely.

This autonomy gives us an enthusiastic and hardworking Committee, such as the Affiliates have had over the past few years – the responsibility to plan and act in the best interests of the AMEU, not only in the technological sense, but also in the no less important and pleasurable way of meeting socially. We are grateful for, and respect the confidence shown in us.

As far as this convention is concerned, I would be failing in my duty, if I did not mention the wonderful co-operation the Affiliates have had from Fred Daniel, Jan Venter and their respective staff. Thank you Fred and Jan.

President Alwin, we congratulate you on attaining the highest office that the AMEU can bestow on any of its members. The hard diligent work and sacrifices you have made are now justly rewarded, and on behalf of the Affiliates I wish you and your wife Joy, the best of health, happiness and good wishes for your term of office. Please be assured that the Affiliates will support you fully.

To the Town Council and citizens of Boksburg, presently celebrating the Town's 100th birthday, please convey our best wishes and hope, that the next 100 years will still show Boksburg growing from strength to strength.

Nico Botha, your nomination as "President Elect" is a very popular choice, together with your charming wife Marietjie, please accept our best wishes. Also please be assured of the Affiliates best attention to your requirements at all times.

Finally, President Alwin, we all knew, expected and certainly received an efficiently run and well organized convention; congratulations to you and your hardworking committee.

It has also been very pleasing to see during the last few minutes, a faint smile of relief on your face, which none of us has seen for some time, especially at AMEU Affiliate Meetings. We also tried to stress the point by saying "Don't worry Al", by your efforts "Alles sal regkom". No doubt you are now happily assured.

So from all the Affiliates, to all those attending the Golden Anniversary Convention, a safe return to your homes and happiness for the future.

#### PRESIDENT:

Mr Marsh could you please rise. I have a token of appreciation for the many years you have been associated with the AMEU, and of course for the address on behalf of the Affiliates. From the AMEU I would like to present to you as a token of appreciation a small gift.

#### MR MARSH: HONORARY MEMBER

Thank you very much Mr President.

#### PRESIDENT:

The closing address on behalf of the Ladies will now be conducted by Mr Pieter Muller from African Cables and I ask Mr Pieter Muller to please come to the rostrum.

#### MR PJ MULLER: AFFILIATE

(ON BEHALF OF THE LADIES)

Mnr die President, lede van die Vereniging, dames en here, dit is inderdaad vir my 'n genoë en eer om hierdie sluitingsrede namens die dames to mag lewer. Die afgelope paar dae in hierdie,

die skoonste Kaap het sekerlik bygedra tot 'n bewustheid van die skone geslag. Die dames het swier aan die openingsseremonie van hierdie konvensie verleen en, weereens met hierdie sluitingsseremonie.

Tussentyds is hulle vermaak en het hulle, hul geamuseer met besoekende aan van die plaaslike nywerhede soos ondermeer 'n wynplaas. Ek verstaan dat die besoekers 'n groot sukses genoem mag word.

Mnr die President, deur die hoë amp wat aan u verleen is vereer u, u stad Boksburg, maar laat my toe om te sê dat dit 'n wys besluit was om die konvensie hier in Kaapstad die moederstad te hou.

In 'n toespraak namens die dames van Kaapstad, dink mens aan waarsynlik die mees beroemde dame in die Kaap se lang geskiedenis, by name Maria van Riebeeck, eggenote van ons land se stigter Jan van Riebeeck, die eerste bevelvoerder van die Kaap van Goede Hoop.

Maria is in die jaar seshonderd nege-en-twintig te Rotterdam, Nederland gebore. Op twintigjarige leeftyd tree sy in Amsterdam met Jan van Riebeeck in die huwelik. In Desember seshonderd een-en-veertig het die van Riebeecks Nederland verlaat vir die lang reis na die Kaap. Die egpaar was met agt kinders geseën. Die van Riebeecks het vir tien jaar in die Kaap verhoed voordat hulle vertrek het na Malakka waar hulle in die jaar seshonderd twee-en-sestig aangekom het. Maria is in seshonderd vier-en-sestig oorlede kort na haar vyf-en-derdertig verjaarsdag. Sy was 'n beminde persoon in die Kaap en die enigste skinder storie wat oor haar bekend was, was dat sy die jongste modes nagevolg het. Maria het die voorbeeld gestel vir die vroue van die Kaap en, in feite, Suid-Afrika.

Dit is dan ook so passend dat sy hier in die Heerenracht teenoor haar eggenoot staan.

Mr President, it is my very pleasant task to make a closing speech on behalf of the ladies who have been associated with this conference. I am not sure whether you are aware of it, but I was charged with this responsibility also in 1985. When invited to do it once again, a number of questions came to mind: was I being invited to do it again because I did it so well first time; or is there a shyness among the members of our executives when it comes to the ladies. Whatever the answer, I remain delighted at having received the invitation.

In preparing the speech, I inevitably look for some entertaining items that would relate in a special way to the ladies. I was reminded in looking at interesting quotations at how the Earl of Chesterfield advised the men of his day to cope with women. He said:

"A man of sense only trifles with women, plays with them, humours and flatters them as he does with a spiteful and forward child; but he neither consults them about nor trusts them with, serious matters."

If I were seriously to promote such sentiments today, my life would be not worth living and I would be hounded to ground by the many millions of liberated women that abound.

Happily, I do not share the sentiments of the Earl of Chesterfield. But I do wonder how much progress has really been made when I take account of the more modern commentator in his definition of the word incompatible. He says simply, "incompatible is the spice of life provided he has income and she is patable."

I think a measure of the distance we have come is indicated by the very fact that the ladies are present and here with us today. I cannot imagine the Earl of Chesterfield allowing such an event and nor can I imagine our chauvinist commentator agreeing to the ladies sharing in what might be considered the more serious or intellectual pursuits of the day.

As is always the case, I can only say that the ladies have brought a dimension to this gathering that is not only profound in terms of the high quality of loveliness that we have with us; but certainly in terms of the high quality of interesting and stimulating discussion that has been added to what is normally boring talk about technical things.

Mr President, I know that you have a very high regard for ladies in general and most essentially for the ladies who have graced this conference. It gives me immense pleasure on behalf of the ladies here to express sincere good wishes and congratulations to you, Mr President and to Joy, and your executive and to the fair Cities of Boksburg and Cape Town for the hospitality they have extended.

#### PRESIDENT

Mr Mayor of Cape Town, Alderman P R Muller, Mr Mayor of Boksburg, Councillor Buckle, honoured guests, Ladies and Gentlemen.

After nearly three days of deliberation, the time has come to bring proceedings to a conclusion.

The events at this Convention were the climax and culmination of many months of planning and organising, involving numerous people, from Boksburg to Cape Town and elsewhere.

It is extremely difficult to identify persons and organisations who have contributed to the success of such a convention and there is a real risk of unwittingly excluding one or more persons with resultant unhappiness. I pray that this does not happen.

To each and every one who has in any way, no matter how small, contributed to the success of this Convention a deep and sincere thank you. On his own, the President's task is an impossible one, but with all your help I can look back on, I hope, a successful and certainly enjoyable task and this event will carry with it for me, many happy memories in the years to follow.

Aan u mnr die Burgemeester van Kaapstad, my innige dank en waardering aan u en u Raad namens die VMEO, die afgevaardigdes en hul gades, vir u bereidwilligheid, dat hierdie 50ste konvensie hier in Kaapstad kon plaasvind asook die heerlike burgerlike onthaal wat u en u Raad verlede Maandagaand vir ons aangebied het.

Ek hoop en vertrou natuurlik dat u ook iets van hierdie Konvensie en die VMEO sal onthou en saam met u sal neem.

Baie dankie ook aan minister PTC du Plessis wat ons vereer het om die Konvensie amptelik te open en mnr Johan v d Merwe wat die hoofrede gevoer het.

Graag wil ek ook my eie Burgemeester, Raadslid Piet Buckle en die Stadsraad van Boksburg hartlik bedank vir die ondersteuning wat ek ontvang het maar ook vir Boksburg se bydrae by wyse van die mansjetknope vir die afgevaardigdes, finansiering van die vervoerreëlings en 'n paar ander geskenkies aan sekere van die gades. Ek waardeer u en u gade, Anna se teenwoordigheid ten seerste.

Raadslid Ben Steyn en sy gade Sally, Onder-Burgemeesterspaar van Boksburg, is natuurlik ook hier, maar Ben is al 'n "ou" VMEO-lid wat die afgelope klompie jare ons kongresse bywoon - he is part of the furniture. Dankie Ben, vir jou en Sally se deelname.

'n Woord van besondere dank aan die Uitvoerende Raad wat my bygestaan het en individuele lede wat met geesdrif aangebied het om my met die reëlings behulpsaam te wees en baie wat sommer baie gedoen het. My groot dank aan al daardie lede.

Hier in Kaapstad het ek groot staat op Fred Daniel, sy adjunk Jan Venter en hulle doeltreffende personeel gemaak. Ek wil graag vir Fred baie dankie sê vir sy hulp en ondersteuning en dat hy toegestem het dat Jan Venter die sleutelfiguur hier in Kaapstad was.

Jan, ek is voorwaar groot dank aan jou verskuldig:-

Fred baie dankie ook dat jy die spreiligte, wat in die nag tafelberg verlig, vir die VMEO aangeskakel het. Dit is pragtig!

Ons getuig ook ons dank aan mnr Fred Daniel en sy departement, wat in elke van die hotelkamers, van die amptelike hotelle, 'n groetkaartjie en heerlike bottel wyn geplaas het.

Then there was the photographer from the Electricity Depart-

#### PRESIDENT:

Mr Muller I also have a token of appreciation to present to you for the address on behalf of the ladies. Thank you very much for a job well done.

#### MR PJ MULLER: AFFILIATE

Thank you very much Mr President.



Joy en Alwin Fortmann

ment of Cape Town who did a very professional and marvellous job, taking pictures. Thank you to Cape Town for that.

Groot dankie ook aan Kaapstad se mense - die ander baie helpepers van die Departement Elektrisiteit van Kaapstad. 'n Klompie van die name is:-

#### LADIES:

- |                   |   |
|-------------------|---|
| 1. Patsy Sierra   | - General information and registrations |
| 2. Pat Hodgson    | - General information and registrations |
| 3. Marina Du Toit | - Word processor                        |
| 4. Wendy Wiid     | - Typist                                |
| 5. Jenny Meyer    | - Information assistant                 |
| 6. Eleanor Ment   | - Information assistant                 |
| 7. Mrs Combrink   | - Flower arranger                       |

#### MEN:

- |                     |  |
|---------------------|--|
| 1. Peter Boyd-White | - Co-ordinator - I can assure you Ladies and Gentlemen, Peter worked extremely hard. |
| 2. Roy Blazer       | - Audio visual and sound   |
| 3. Dave Donald      | - Audio visual and sound   |
| 4. Blackie Swart    | - Transport/conference hall assistant  |
| 5. Willem Swart     | - Transport/conference hall assistant  |
| 6. Robert Vine      | - Conference hall assistant  |

To the authors of the Papers our heartiest thanks for your long hours of hard work you have put into their preparation and of course their presentation.

Also a big thank you to all the contributors - formal and informal.

Without the delegates you cannot have a Convention and your attendance together with your wives is much appreciated.

Thank you to Messrs John Dawson and Eugene Pretorius who served on the Executive Council and who are no longer represented there. Your absence will be missed, but we know what you have contributed and for that we are deeply grateful.

Plekke met die grootte van Boksburg het nie die talle personeel wat ingespan kan word om met die honderde take wat verrig moet word, behulpsaam te kan wees nie en moet daar op 'n paar persone staatgemaak word.

Hier kan ek nie my eie sekretaresse, Mev Salomé Goosen weglaat nie.

Sy het in die afgelope jaar na agtien maande, reuse werk verrig om met die reelings, korrespondensie en dies meer behulpsaam te wees. Dit was vir haar meer as net 'n plig wat sy moes verrig. Baie dankie Salomé. Dankie ook aan Roelof van Wyk, Renette Levin, Agnes Engelbrecht, Christa Jordaan en Danie Erasmus wat ook gehelp het en die hulp wat ek van mnr Visser v d Merwe van die Departement, Direkteur Bestuursdienste ontvang het.

Baie dankie aan Jan Loubser wat as President my gedurig bygestaan en my van raad voorsien het. Dankie ook aan dr Nico Botha vir sy morele steun tydens hierdie Konsense in byvoorbout vir sy ondersteuning vir die komende twee jaar.

Then there are various firms to thank.

Firstly, our Affiliate Members, who as a group need special mention. Of course, I have already thanked individual companies for sponsoring the delegates luncheons, the very enjoyable and lovely Weinfest on Tuesday evening, but wish to reiterate our appreciation and gratitude.

Let me not forget the lovely day sponsored by the Affiliates for our golfers and bowlers on Sunday.

Then there are the luncheons and tours for our Ladies, by Messrs African Cables on Monday to Constantia Nek, Messrs GEC on the wine tour on Tuesday and Messrs Brown Broveri and Messrs Golnix on the factory visits and fashion show on Wednesday.

It is my contention that if the Ladies have an enjoyable convention, you have a more than even chance that the convention will be a success. This, I hope has been the case here. Thank you to those Companies.

Messrs Bowthorpe-Hellerman-Deutsch and Messrs Cullinan Electric, for sponsoring the Executive Council braai on Sunday evening and the Executive Council luncheon scheduled for tomorrow, respectively - thank you.

I must make special mention of Mr Glyn Riley, Martin Lacey, Rod Pienaar and Peter Elder, who prepared and assisted with the showing of the slides with my presidential address.

A special word of gratitude to Martin Lacey of GEC, for assisting with the transportation of gifts and other AMEU goods from Boksburg to Cape Town.

At the helm of the Affiliates is a dear friend of the AMEU, Mr Terence Marsh with Vice-Chairman Brian Madeley and the Affiliates' lovely Secretary, Carol Bennett and their Committee. I wish to record, on behalf of the AMEU, my sincere gratitude for your invaluable effort and dedication in helping to make this Convention a success.

What would we, the AMEU, do without you?

We value what you do for this Association.

You know Ladies and Gentlemen, of all the municipal associations and institutes, the AMEU has this unique relationship with private companies where they are Affiliate members of the

AMEU, which the others don't have and for my part I would not want it any other way.

Today is a special day for Terence. Although I understand he is due to continue working on a part-time basis for Asca for a while, Terence officially retires today and that is in about twenty-five minutes from now. On 17 September, Terence had a birthday - happy birthday from all of us for that day.

Terence, I am indeed honoured that you were able to be the Chairman of the Affiliates for this Convention and for your personal interest and assistance to the AMEU and in particular to me.

To you and Daphne we all wish you a happy and long retirement and may God bless you both.

There are also other firms, not affiliated to the AMEU who have made their contributions.

Firstly I would like to thank Trust Bank for their hard work so professionally performed by the lovely Ladies who manned the registration tables and assumed the general administrative tasks in the foyer.

The Ladies from Trust Bank who stayed for the three days are: Lorna Bishop - Reception and Erna Kruger - Cashier.

To the Manager of Trust Bank, Hennie Redelinghuys, who was in overall charge of the Ladies.

Then there are the brief cases supplied by Trust Bank.

On behalf of the AMEU a hearty thank you and I sincerely hope that this relationship with Trust Bank will continue with future Conventions.

Thank you.

I would like to thank ESCOM for sponsoring the name tags.

The following companies made monetary contributions:-

Mnr Lumley Versekeringsmakelaars (Edms) Bpk - Johannesburg

Messrs Pick-'n-Pay Hypermarket - Boksburg

Messrs Satellite Take Away Foods - Boksburg North

Messrs Build Elec Electrical Contractors - Boksburg

Messrs Barclays Bank - Dunsuwart, Boksburg

Messrs C & I Electrical Eng Contractors (Pty) Ltd - Boksburg

Messrs A du Toit Electrical Contractor - Boksburg

These monetary contributions were used to buy gifts for the Ladies - in the main, the silver bracelets.

Further sponsorships were as follows:-

Messrs Ratio Electric - Boksburg, manufacturers of HV and LV CTs, for the Ladies bags.

Messrs Colgate Palmolive for the gift parcels for the Ladies.

Messrs v d Berg & Jurgens, perhaps better known to many as Lever Brothers, for the Rama margarine dishes, also for the Ladies.

Messrs Reeve Beauty Products for the perfume.

Messrs Power Engineers, Asca Electric-Aberdare Cables and Siemens SA (Pty) Ltd, for the luncheons at the Cape Sun Hotel for the delegates on Monday, Tuesday and Wednesday respectively.

These luncheons were indeed appreciated by all the delegates.

Messrs Toyota Marketing for the use of a Toyota Cressida car at the time of the Convention.

Messrs Circuit Breaker Industries Ltd, who are affiliated to the AMEU, for the 1st, 2nd and 3rd prizes respectively for the AMEU dance on Wednesday - that is this evening.

Be there Ladies and Gentlemen, you may just be a lucky winner.

Then there have been the exhibitors in the lobby on the second floor and in suites on the tenth and thirty-second floors, who have added colour to the Convention. This is also appreciated.

In the build-up to the Convention and now during the Conven-



Annetjie van der Walt oorhandig 'n rukker aan Joy Fortmann.



tion I am pleased and proud to have had my wife, Joy, to assist and stand by me and who played an important part in the Ladies' programme. Joy, a big hug and thank you for your invaluable assistance.

Joy was aided by Mona Daniel, Rina Venter and Annetjie van der Walt. To these Ladies I express a special thank you - you have been great.

Ons Sekretaris, mnr Bennie van der Walt. Hier is 'n man wat gedurig met die reëlings besig was en was ek en hy dikwels, amper voortdurend, in verbinding i.v.m. die reëlings.



*Joy Fortmann oorhandig 'n ruiker aan Anna Buckle, Burgemeestersvrou van Boksburg.*

Hy, met al die jare ervaring, en ek as 'n nuweling het baie deurgemaak en het ek baie van Bennie geleer en natuurlik het hy reuse werk verrig.

Hartlik dank Bennie vir jou hulp en bystand om hierdie Konvensie 'n groot sukses te kon maak. Die pragtige agenda is 'n voorbeeld van sy vernuf wat hy aan die dag gelê het.

Many thanks also to Jill Scott and the Staff of the Cape Sun Hotel who have displayed courtesy and assistance throughout the Convention.

Ek vra u nou om al die werkers, borge en almal wat op een of ander wyse 'n bydrae gemaak het, groot applous te gee.

Ladies and Gentlemen, it is my deep and sincere hope that you have all enjoyed this Convention to the full and that it will be a Convention you will long remember.

At this point there are a few presentations to be made to a number of persons and I will call them forward individually:-

Alderman Muller on behalf of the Mayoress of Cape Town.

Mrs Anna Buckle, the mayoress of Boksburg.

Mrs Joy Fortmann.

Mrs Mona Daniel, Rina Venter and Annetjie van der Walt.

Messrs Fred Daniel and Jan Venter.

#### LADIES:

1. Patsy Sierra
2. Pat Hodgson
3. Marina Du Toit
4. Wendy Wiid
5. Jenny Meyer
6. Eleanor Ment
7. Mrs Combrink

#### MEN:

1. Peter Boyd-White
2. Roy Blazer
3. Dave Donald
4. Blackie Swart
5. Willem Swart
6. Robert Vine

#### TRUST BANK PERSONNEL:

1. Lorna Bishop
2. Erna Kruger

Thank you Ladies and Gentlemen.

Ladies and Gentlemen, the following members will be retiring before the 1989 Convention, and it is fitting that we bid them farewell and wish them health and happiness. These are the members who have been part of the AMEU - who have been the pillars of our Association. The ones I am aware of are:-

Mr Piet Du Toit, Town Electrical Engineer of Orkney - March or August 1988.

Mr TA (Tom) Theron, Town Electrical Engineer, Ermelo - March 1989.

Mr Ken Robson - October 1987.

Mr Jules von Ahlften - October 1988.

Mr Dennis Fraser - February 1989.

To these members I firstly would like to say how we have valued your membership and your contribution to the AMEU.

May you and your wives and loved ones enjoy a long and happy retirement and we wish you God's speed.

Lets give them a big hand, Ladies and Gentlemen.

#### MMRE JOHAN MARAIS EN JAN MALAN (KEMPTON PARK)

Ons hartelike gelukwensing aan self vir:-

- (a) die reëlings van die konvensie;
- (b) u leiding van die vergadering;
- (c) u presidentsrede - al die inhoud asook die pragtige toepaslike kleurskifies;
- (d) u optrede in die publiek teenoor alle eregaste en afgevaardigdes by die vergadering;
- (e) die vlotte verloop van die hele konvensie;
- (f) die bydrae van die sekretaris tot hierdie konvensie.

#### DR N BOTHA: AANGEWESSE PRESIDENT:

Meneer die President vergun my net asseblief 'n kort spreekbeurt. Ek wil u graag namens al die afgevaardigdes en dames van harte bedank vir die baie goeie en doeltreffende wyse soos u die groot vergadering gelei het. U het u self bewys en in u eie reg as 'n goeie leier na vore getree. U het u baie goed voorberei en daarom het die verrigtinge so mooi vlot verloop. Nogmaals baie, baie dankie Alwin en Joy vir 'n pragtige Konvensie en mag julle 'n baie suksesvolle ampstermyn ervaar.

#### A FORTMANN: PRESIDENT

Baie dankie mmre Marais, Malan en dr Botha vir u mooi woorde, ek waardeer dit wat u gesê het ten seerste.

Dames en here, ek hoop dat u almal die VME0 se dinee/dans hier in die Cape Sun Hotel vanaand sal kan bywoon, waar ons heerlik saam sal kan verkeer en ontsaan.

Die van u wat nie sal kan kom nie en wat reeds vandag nog u reis huistoe neem en natuurlik vir die res van u wat dan môre en later huiswaarts keer, wens ek 'n veilige reis terug.



*Peter Muller, Affiliate Member; Alderman Peter Müller, Mayor of Cape Town; Alwin Fortmann, President of the A.M.E.U.; Cnr Piet Buckle, Mayor of Boksburg and Terence Marsh, Honorary Member.*

Just before the final closure allow me to quote a verse titled "TAKE TIME . . ." with acknowledgement to the Hotel Van Riebeeck in Benoni.

**TAKE TIME . . . "**

Take time to work  
It's the price of success.  
Take time to play  
It's the secret of perpetual youth.  
Take time to think  
It's the source of power.  
Take time to read  
It's the fountain of wisdom.  
Take time to worship  
It's a highway of reverence.  
Take time to pray  
It's the greatest power on earth.  
Take time to laugh  
It's the music of the soul.

Take time to listen  
It's the pathway to understanding.  
Take time to dream  
It's hitching your wagon to a star.  
Take time to love and be loved  
It's the gift of GOD.

Thank you all for your attendance and may God bless you.  
Veilige reis terug en ek bid u God se rykste seën toe.  
I now declare the 50th AMEU Convention closed.

Thank you, Dankie.

# OUR BOARD MEETS TOMORROW.



Rhino Gypsum's commitment is to quality and service and to help build a future for this country which holds equal opportunities for all our people. Whatever we plan, Rhino Gypsum's thoughts are on tomorrow. And on improving the tomorrows of all South Africans.

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GREY PERSPECTIVES 295

# MEMBERSHIP LIST - LEDELYS

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BOTH WA: Adjunkhoof Elektrotegniese Afdeling, Posbus 34, Potgietersrus 0600  
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**F**  
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**H**  
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**K**  
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**L**  
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**M**  
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**P**  
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**S**  
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**T**  
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**V**  
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1938  
LL HORRELL - Pretoria

1944  
GH SWINGLER - Cape Town

1945  
AT RODWELL - Johannesburg

1950  
DR JH DOBSON - Johannesburg

1951  
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1955  
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1956  
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1957  
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1958  
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1960  
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1962  
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1964  
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1965  
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1967  
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1969  
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1975  
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1977  
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1979  
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1981  
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1983  
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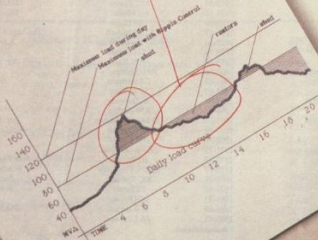
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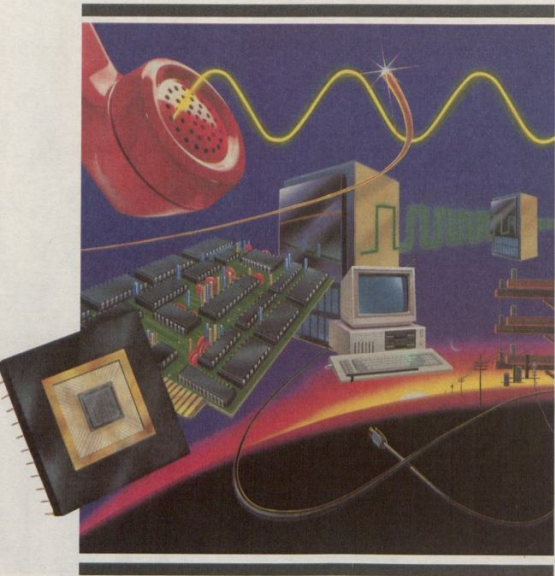


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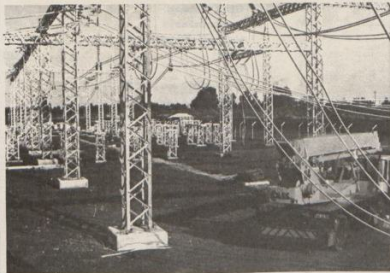
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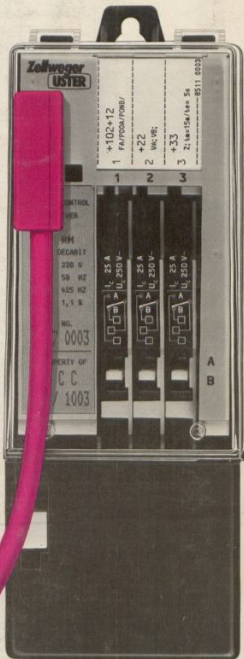
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