

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



200 Volkskas Building  
76 Market Street  
JOHANNESBURG  
2001  
Telephone (011) 838-7711  
Fax (011) 838-7713

**DIE VERENIGING VAN  
MUNISIPALE ELEKTRISITEITSONDERNEMINGS  
VAN SUID-AFRIKA**

Volkskasgebou 200  
Markstraat 76  
JOHANNESBURG  
2001  
Telefoon (011) 838-7711  
Faks (011) 838-7713

**MONDAY 2  
TO WEDNESDAY 4  
OCTOBER 1989  
CAPE SUN HOTEL  
CAPE TOWN**

**MAANDAG 2  
TOT WOENSDAG 4  
OKTOBER 1989  
CAPE SUN HOTEL  
KAAPSTAD**

**51**

**CONVENTION PROCEEDINGS**

**KONVENSIE VERRIGTINGE**

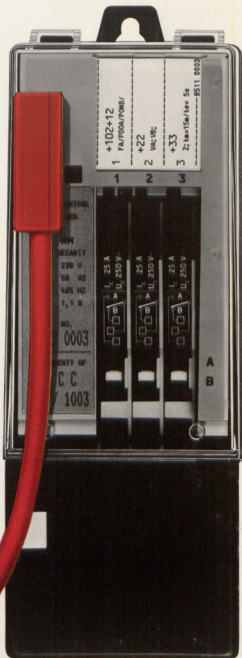


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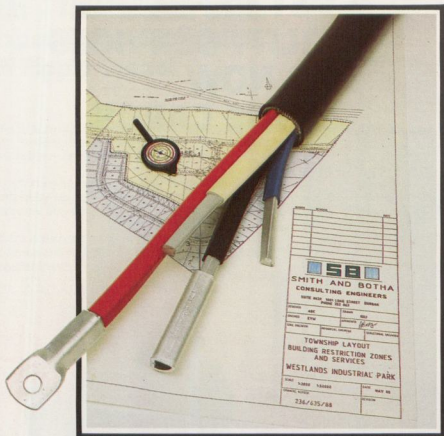
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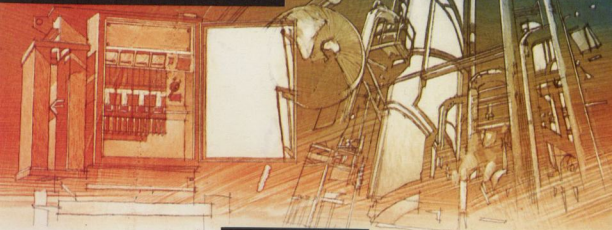
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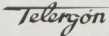
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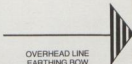


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## DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS (SUIDELIKE AFRIKA)

VOLKSKASGEBOU 200, MARKSTRAAT 76, JOHANNESBURG 2001. TEL. (011) 838-7711 FAKS (011) 838-7713

51st CONVENTION  
OFFICIAL PROCEEDINGS  
MONDAY 2 TO WEDNESDAY 4  
OCTOBER 1989  
CAPE SUN HOTEL, CAPE TOWN



51e KONVENSIE  
AMPTELIKE VERRIGTINGE  
MAANDAG 2 TOT WOENSDAG 4  
OCTOBER 1989  
CAPE SUN HOTEL, KAAPSTAD

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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.

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Die VME0 is die organisasie wat 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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# AMEU EXECUTIVE COUNCIL 1989 – 1991 VME0 UITVOERENDE RAAD



*Seated/Sittende L-R  
 Cnr C Cohen, Rdl C D Hawkins, A H L Fortmann, Cnr F van der Velde,  
 F L U Daniel (President), Rdl F H Kotzé, C F Adams (President  
 Elect/Aangewese President), J K von Ahlften (Tech Secr/Teg Sekr),  
 B van der Walt (Secr/Sekr)*

*Standing first row/Staande eerste ry L-R  
 JE Heijdenrych, J D Dawson (Hon. Member), E G Davies (Hon. Mem-  
 ber), Rdl J G Grobler, Rdl D Taljaard, Rdl R Classen, P J Botes (Erelid),  
 M P P Clarke (Hon. Member), J A Loubser (Erelid), Cnr C Plange  
 Standing second row/Staande tweede ry L-R  
 Cnr T Khoury, C J Scherman, Rdl dr C F Swart, Rdl K Meiring, D  
 B Briers, J G Malan, H D Beck, K J Murphy, A J van den Berg*

TABLE OF ATTENDANCE / TABEL VAN BYWONING

Honorary Members	14	Erelede
Guests	38	Gaste
Local Authorities	81	Plaaslike Besture
Engineers	151	Ingenieurs
Associates	15	Assosiaatlrede
Affiliates	210	Geaffilieerdes
Ladies	304	Dames
Staff	17	Personeel
	<hr/>	
	830	
Apologies	7	Verskonings

OFFICIAL OPENING / AMPTELIKE OPENING

Rev. Paul Welsh opened the proceedings with scripture reading and prayer.

Ds Paul Welsh het die verrigtinge geopen met skriflesing en gebed.

WELCOME AND INTRODUCTION BY PRESIDENT, MR A H L FORTMANN

Mnr die Burgemeester, raadsheer Gordon Oliver en die Burgemeestersvrou mev. Stern, dr Neethling, Hoof Uitvoerende Beampte van die Nasionale Energieraad, erelede, eregaste, dames en here. Dit is vir my 'n groot eer en besondere voorreg om u almal hartlik welkom te heet by hierdie 51ste Konvensie van die Vereniging van Munisipale Elektriesiteitsondernemings van Suid-Afrika.

In besonder wil ons dr Neethling welkom heet, wat ons met sy teenwoordigheid vereer en wat die openingsrede sal lewer, asook dr Du Plessis, Direkteur-Generaal van die Suid-Afrikaanse Buro vir Standaarde, wat die hoofrede sal voer.

Min het ons besef dat na die 50ste Konvensie in 1987 die 51ste Konvensie nie net weer in Kaapstad nie, maar weer in dieselfde vergadersaal sal plaasvind. Soos die meeste van u weet, het mnr Fred Daniel die Aangewese President geword, nadat dr Nico Botha dié amp moes vaarwel sê toe hy Stadsklerk van Bloemfontein geword het.

Ek kan net noem dat hierdie die grootste Konvensie in die geskiedenis van die VMEO is, met 'n ledetal van 800 geregistreerde afgevaardigdes insluitende dames.

OBITUARIES : DOODSBERIGTE : MOTION OF CONDOLENCE : MOSIE VAN ROUBEKLAG

Sedert die 12de Tegniese vergadering in Potchefstroom, het 'n paar van ons lede tot sterwe gekom en is dit met innige leedwese dat ek gewag moet maak van die afsterwe van die volgende voormalige VMEO-lede — ons voormalige vriende en kollegas.

Since the 12th Technical Meeting in Potchefstroom, a few of our members passed away and it is with deep regret that I have to refer to the death of the following past AMEU members — our former friends and colleagues.

- (1) Mr I H Hess, Past Member and retired City Electrical Engineer of Cape Town who passed away on 12 April 1989.
- (2) Mr John (Jimmy) as he was known in the AMEU) Leonard McNeil, previously Borough Electrical Engineer of Kockstad from where he retired. He then joined Hospital Services and was based in Ladysmith. Jimmy passed away on 18 April 1989.
- (3) Mr Frank Stevens, Honorary Member and previously Town Electrical Engineer of Ladysmith in Natal, passed away on 24 June 1989.

Ons diepe meegevoel word aan hulle naasbestaendes oorgedra. Ek versoek alle aanwesiges om as 'n blyk van eerbied, vir 'n rukkie in stilte te staan.

Our deepest sympathy is extended to their families and I request all present to stand for a while in silence as a mark of respect.

WELCOME TO HONORARY MEMBERS AND PAST PRESIDENTS/VERWELKOMING VAN ERELEDE EN VOORMALIGE PRESIDENTE

We are proud to have in our midst a number of Honorary Members and Past Presidents and ask them to rise as I call out their names, so that we may see who they are.

Messrs/Mnre:

- William Beesley — Honorary Member
- Wessel Barnard — Past President and Honorary Member
- Piet Botes — Past President
- John Dawson — Honorary Member
- Dennis Fraser — Past President and Honorary Member
- Hennie Hugo — Honorary Member
- Jan Loubser — Past President
- Pat Middelcote — Honorary Member
- John Morrison — Honorary Member
- Dennis Palser — Honorary Member
- Eugene Pretorius — Past President and Honorary Member
- Jose Rodrigues Telles — Honorary Member
- Leslie (Les) Smith — Honorary Member
- Gawie Theron — Past President and Honorary Member
- Jules van Ahlfen — Past President and Honorary Member
- Robbie de Lange — Honorary Member

I would like to extend a special word of welcome to them. Give them a big hand Ladies and Gentlemen.

WELCOME TO DELEGATES/VERWELKOMING VAN AFGEVAARDIGDES

A special word of welcome to a number of guests and visitors from organisations both in South Africa and overseas. From the United Kingdom — Mr Malcolm Wheatley, who is also a guest speaker and also Mr Mike Suthers.



Mnr Alwin Fortmann, uitredende President, verwelkom die afgevaardigdes.

We have representatives with us from the following Sister Institutes and other organisations:-

The Institute of Town Clerks of Southern Africa represented by Dr Stanley Evans.

The Institution of Municipal Engineers of Southern Africa, represented by Mr John Eagar, Vice-President.

The Institute of Municipal Treasurers and Accountants represented by Mr Ronnie Grace.

AS & TS represented by Mr Les James, the President.

The South African Institute of Electrical Engineers, represented by its Senior Vice-President, Mr Ron Leigh. It was Ron's birthday yesterday, so from all of us a happy birthday for yesterday.

Eskom, represented by Mrs Marie Davison, together with one or two other delegates. Marie is accompanied by her husband Eric who is also an Electrical Engineer.

The Electricity Control Board, represented by Mr Wessel Barnard.

From the Kwazulu Finance and Investment Corporation, we have Mr Bertus Luus with us.

Kaap Provinsiale Administrasie Gemeenskapdienste — Noord-Kaap — Kimberley, wat deur mnr Frickie v d Walt verteenwoordig word.

Oos-Rand Streekdiensteraad, verteenwoordig deur mnr J Vorster.

Orange Free State Provincial Administration represented by Mr Bob Davidson, who is also a staunch AMEU supporter.

Department of Manpower — Mr André du Plessis.

The Transkei Electrical Supply Corporation represented by Mr Rob Stone.

The South African Bureau of Standards represented by Messrs Isaac Kruger, Kees van Alphen, Jim Toms and John Calhoun.

The National Energy Council represented by Dr D C Neethling, Dr Gert Venter and Mr Johan Basson.

Die Technikon Pretoria — hier het ons mnr. Danie Bisschoff en Tinus Bornman as verteenwoordigers.

Western Cape Regional Services Council — Represented by Mr Bob Strickland.

House of Representatives: Department Local Government, Housing and Agriculture — Represented by Messrs Leon Eksteen and Robert McCree.

Hoofdirektoraat — Grondontwikkelingskoördinerings — Verteenwoordig deur mnr Deon Veldsman.

Departement van Openbare Werke en Grondsaak — 'n Ou bekende in ons midde — mnr Felix Prins.

Suid-Afrikaanse Vervoerdienste, Johannesburg — Mnr J J Marais.

Potchefstroomse Universiteit vir Christelike Hoër Onderwys verteenwoordig deur Professor Ian Lane en mnr William Pretorius.

SATV and SABC — Messrs Pat Fraser, Willie Stachelhaus, Syd van Niekerk en Ian Webb. Syd van Niekerk is incidently my next-door neighbour back home in Boksburg.

Various members of the Press.

The Affiliates — Mr Brian Madeley and his Committee.

Other visitors and guests include:

Mr Eric Connor from Elandsfontein,  
Mr Ronald Gilmour of Fish Hoek (ex Cape Town Engineer),  
Mr André de Villiers from Hermanus and  
Mr John MacKay from Kirstenhof (ex Cape Provincial Administration)

Last, but certainly not least, a very warm welcome to all the delegates. It is a truly magnificent sight to have you present in this Convention hall.

We are indeed privileged to have you grace our Convention and we bid you a hearty welcome. I trust that you will find this Convention interesting and fruitful and invite you to take part in the proceedings at formal and informal level and urge you to make yourself at home.

## APOLOGIES

A. We have received apologies for non-attendance from the following persons:-

1. Mr John Grundy who is commissioning the lighting of 23 km and 5 interchanges of the N1 Ben Schoeman Highway, involving over 3 000 lanterns.

On behalf of the AMEU I would like to congratulate John Grundy and Duncansby (Pty) Ltd Lighting on this large project.

2. Mnr Hennie Botha, President van die Instituut van Munisipale Ingenieurs van Suidelike Afrika, oorses is.
3. Mnr C J van Schalkwyk van die Munisipale Werkgewersorganisasie.
4. Mnr Jan van Zyl, Direkteur van die Munisipale Vereniging van Transvaal.
5. Plaaslike Owerhede:-
  - 5.1 Harrismith
  - 5.2 De Aar
  - 5.3 Jam Kempdorp
  - 5.4 Ventersdorp
  - 6.
  - 6.1 Alusaf
  - 6.2 C A du Toit en Vennote ingelyf
  - 6.3 Dr Ralph Anderson Honorary Member and from the National Energy Council
  - 6.4 Terrance Marsh — Honorary Member

B. Greetings were received from:-

1. Mr John Grundy and the organisations he represents, namely as Honorary Secretary of SANCI and as Publications and Public Relations Officer of ILESA, SALA (the South African Lighting Association), and SACSA (the South African Colour Science Association).
2. Mnr Hennie Botha, President van IMISA.
3. Mr Ken Robson — Honorary Member
4. Mr R M Simpson — Honorary Member
5. Mr Terrance Marsh — Honorary Member

## MR R A LEIGH: JOHANNESBURG

Thank you Mr President. Ladies and gentlemen I bring the AMEU the special greetings of the South African Institute of Electrical Engineers. Best wishes from our President, Professor Reynders, and I have been particularly asked to mention the stirring work done on the Council of the SAIEE by your outgoing President, Al Fortmann. Not only has Al found the time to tend to your affairs and he's done extremely well, he's also found time to head the Power Section of the Institute and has done stirring work there to the extent that I see the long awaited Municipal interest group being formed within our Institute because I have noticed that the work that Al and many of his fellow Municipal and other Power Engineers have been doing has been introducing more and more into our Institute, the interest of the distribution of electricity.

To the incoming president, Fred Daniel, congratulations on your coming induction and we know also that you fly the flag of the Institute in the Cape Western Centre, so we feel well represented and the Institute conveys its congratulations to Al and to Fred and wishes them everything of the best.

## DR S EVANS: INSTITUTE OF TOWN CLERKS

On behalf of the Town Clerks I would like to wish you all the best for the year that you have just finished and laying down the chain, sir, and its been a good year, I am sure of that and that you have enjoyed this position. Welcome to the City, greetings from the Institute of Town Clerks and also a special word of good wishes to our City Electrical Engineer who takes that heavy chain off your neck sir, in a few minutes time and we wish him well in that office and welcome to you all in our fair city. Thank you sir.

## MNR A H L FORTMANN: PRESIDENT

Die nuwe Elektrotegniese Stadsingenieurs teenwoordig, is spesiaal verwelkom ni:-

Fred Berman-Taylor	— Parow
Edwin Chapman	— Brakpan
J.R. Coqui	— Stillfontein
Dries du Plessis	— Jeffreysbaai

Johan Kaltwasser	— Kraaifontein
Johan Nel	— Ballito
Oppie Opperman	— Springs
Ryno van der Riet	— Durbanville
Johannes Venter	— Tembisa
Cilliers Vosloo	— Heidelberg TVI
Howard Whitehead	— Durban
David Williams	— Klerksdorp

## WELCOME TO CAPE TOWN BY HIS WORSHIP THE MAYOR OF CAPE TOWN/VERWELKOMING IN KAAPSTAD DEUR SY AGBARE DIE BURGEMEESTER VAN KAAPSTAD

### MR A H L FORTMANN: PRESIDENT

Twee jaar gelede was dit Raadsheer Peter Müller wat ons hier in Kaapstad verwelkom het. Nou onlangs is Raadsheer Gordon Oliver as die nuwe Burgemeester van Kaapstad verkies en is dit hy wat ons hier met sy teenwoordigheid vereer.

Ladies and Gentlemen, I now call on Alderman Gordon Oliver, Mayor of Cape Town to welcome you to this beautiful City.

### ALDERMAN G R OLIVER

Mr President, delegates, distinguished guests, ladies and gentlemen.

May I begin by welcoming you to the Mother City. After a long break of 16 years, we were privileged to be able to host, on behalf of Boksburg, this Convention two years ago and we are delighted that the Association has returned to Cape Town so soon.

This 51st Convention is especially important for us because, as you know Cape Town's City Electrical Engineer, Mr Fred Daniel, is to become the next President of the Association. In so doing, he continues a tradition of Capetonian involvement with the Association which began when it was formed by 22 engineers in 1915, and since then our electrical engineers have made an enduring and lasting contribution to the affairs of the Association. In particular, one recalls colourful characters like C G Downie, who was president of the AMEU, and a staunch supporter of the organisation throughout his long career.

I am sure when Faraday discovered the electro-magnet induction coil he never could have imagined to what extent electricity would change our lives. Ironically, I believe that the City fathers initially resisted electricity in Cape Town, and it was only when the tramway company threatened to begin its own service that the then Council were moved to accepting that electricity was here to stay! For this reason, Cape Town, which has a long list of 'firsts' — from heart transplants to high rise buildings — was not the first city in South Africa to provide electricity.

The City of Cape Town Undertaking was established in 1895 and the first power station erected at the Molteno Reservoir, which was, as I understand it, the first hydro-electric scheme in Africa. It consisted of two, 150kW, DC, 440 volt generators and supplied only private and street lighting in a municipal area which at that time amounted to just nine square miles.

How times have changed! Today we distribute 3 900 Giga watt hours, with a maximum demand of 782 megawatts and there are currently something like 234 000 consumers who purchase their electricity from us.

A quick glance at your programme, Mr President, reveals just how full and demanding a schedule you have prepared between now and Wednesday. In particular I am certain that a number of pressing and trenchant issues facing the profession will emerge, such as privatisation, the national shortage of electri-

cal engineers, and our ability as local authorities to meet growing energy needs.

Privatisation is a complex issue indeed, and although generally most desirable, should not be mistakenly considered to be a panacea for all our economic ills in this country. However, I am pleased to say that my Council has been in the forefront of the national privatisation effort.

There has been a growing realisation in recent years that no public body could, or should continue, to meet the increasing demands made on its financial and other resources. This view is reinforced in those countries which have reduced the proportion of State contribution to the GDP have then demonstrated relatively higher economic growth rates.

Privatisation has made a major impact on city development. The Council, which already works extensively with the private sector, has prepared and approved a major report on the subject. In fact, this report is regarded as the definite document dealing with privatisation in local authorities. Cape Town's pioneering role in this field has been recognised in the appointment of the Town Clerk as convener of a National Co-ordinating Committee for Privatisation in Local Authorities.

Locally, progress along the road to privatisation is that a working group has identified 255 functions and 1 121 activities covering all of Council's operations. Fifty areas have been earmarked for investigation. Privatisation will eventually affect certain members of Council staff, and therefore discussions have been held with Unions to receive their responses and inputs. In order for the process of privatisation to be implemented success-



Alderman G.R. Oliver

fully, it is necessary to create the proper framework, climate, and the commitment; these elements are almost all in place.

The whole issue of privatisation of electricity, particularly Eskom, is a complicated subject which I know is receiving attention from an AMEU Sub-Committee chaired by Fred Daniel. Interestingly, one hears in Government circles that Eskom could even be privatised by next year, but in the September issue of Leadership, John Maree writes that the Electricity Council has not yet even made a recommendation to Government on whether Eskom should be privatised *at all*. In fact, one hears that some consumers are uncomfortable at the prospect of electricity privatisation because the prospect of Eskom paying tax and dividends may raise electricity rates.

Personally, one cannot see how privatisation could even occur before 1992 or 1993 at best. As Maree himself points out, the countrywide transmission network controls both generating and reticulation activities. How does one split up for instance, the network to introduce free market competition? Whatever transpires, I am confident that the AMEU, as a body and through its influential membership, will make a significant contribution to both the relevant decision and the process.

The national shortage of electrical engineers is a more immediate problem, and one with serious implications for local Government, and indeed the profession as a whole. In particular, I understand that there is an especially severe shortage of heavy current engineers and I must commend the AMEU for its lengthy campaign to rectify this situation, through means, such as its provision of extremely generous bursaries, at our universities. In this regard I think there is an onus on career counsellors and university academics and administrators to be more active in promoting electricity as a career, and I know that they could rely on your full support.

A more general issue facing us, of course, is how to best deal with the exponential growth in demand for energy. Rapid urbanisation in recent years has outpaced our national electrification programme and urgent steps are required to remedy the current backlog, especially if we are truly serious about improving quality of life and promoting sorely-needed economic progress. I know that Eskom is already in the process of forming partnerships with local private-sector groups to provide townships with a low-cost reticulation system, and this is a positive step, but much more remains to be done.

Mr President, these are just some of the issues, I am sure, which will be receiving the close attention of the AMEU in the next few days, and indeed, months and years. To date the organisation has an impressive record for its contribution to the national energy debate, and I am confident that its part in this process in the future can only become more important.

Mr President, it remains for me to wish delegates a successful and rewarding Convention, and I hope that you will thoroughly enjoy your stay at "the Fairest Cape".

#### MR A H L FORTMANN

Mr Mayor, Ladies and Gentlemen, during the past two years I needed two Presidents-Elect to support me. I don't know why this should have been so, but maybe Dr Nico Botha could not stand the pressure I put on him any longer and he decided instead to become a Town Clerk. I was then given Mr Fred Daniel.

Mnr die Burgemeester, ek het die voorreg gehad om vir meer as 'n jaar saam met u Elektrotegniese Stadsingenieur, mnr Fred Daniel nou te kon saamwerk. Die briefwisseling en die telefoon-gesprekke tussen ons — die telefoonlyn het soms gegons soos ons te kere gegaan het, het bedrywig verloop maar beter samewerking as wat ek van Fred gekry het, kon 'n President nie verwag het nie, al was dit dan vir 'n verkorte tydperk.

Mr Mayor, the last President that Cape Town yielded was in 1958 when Mr C G Downie became President. So, thirty-one years later, your City Electrical Engineer, Mr Fred Daniel is due to take up the Presidential reigns of the AMEU, of which I am certain, your Council and your City will be proud.

I can assure you Ladies and Gentlemen, Fred will lead the AMEU in a manner that will please you.



*Mnr A L Fortmann, die uittrede President, wens die nuwe President, mnr Fred Daniel, geluk.*

Fred, it is now my privilege, on behalf of the AMEU, to ask you to come forward to receive the chain of office of President of the AMEU and in so doing, I extend to you and your wife Mona from Joy and I and all your friends and colleagues here today, good wishes and may you have a very successful and happy two-year term.

#### MR F L U DANIEL: PRESIDENT

Mr Mayor, distinguished guests, ladies and gentlemen. I am deeply conscious of the honour which has been bestowed on me by the members of this important Association in electing me to the office of President. Apart from my own personal gratification, Cape Town shares this honour and with it the opportunity to host this 51st Convention.

It is 31 years since an engineer in charge of the Cape Town Electricity Undertaking was last elected President of the AMEU and this is the fourth time Cape Town has been honoured in this way.

Looking over the list of eminent City and Town Electrical Engineers who have held office in the AMEU since its inception



*Mr Fred Daniel, newly inducted President, addressing the Convention.*



in 1915 and their-influence on the stature of the AMEU, I realise what exalted ranks I have now joined and what a high standard of performance I have to try to live up to. I can only say with honesty and sincerity that I shall do my very best with talents God has bestowed on me and the support I have experienced from friends and colleagues in the AMEU. I am also indebted to my Council for making it possible for me to accept the duties and responsibilities of this office.

Thanks are due to our hardworking AMEU Secretary and the loyal, dedicated and enthusiastic staff within my Department, and in particular the group ably led by Peter Boyd-White, who have attended to the multitude of tasks organising this Convention.

I must acknowledge with grateful thanks the unstinted help and encouragement which I have always enjoyed from my dearest wife, Mona, throughout all the years of our association.

Die 1990's belowe om uitdagende jare te wees en behoort die VME0 'n kans te bied om deel te hê in die toekoms-skepping van die Republiek. Elektriesiteit bied die ideale energie bron wat omgewingsgewys aaneemlik is om die bevolkings-aanwas wat deur kenners voorspel word, as energiebron te dien. Dit is dus baie belangrik dat Elektrotegniese Stadsingenieurs verskerk dat elektrisiteit bemark word teen aanvaarbare tariewe.

Although significant changes have been made in the AMEU's past 74 years in the manner of electricity distribution, if one now views the vast changes that have taken place in all technical spheres I would say that if the electricity supply industry is to maintain its place of superiority significant changes will have to be brought about to meet the needs of the urban growth in the next decade. If the AMEU is to meet this change, new norms will have to be set according to the dictates of the changing environment.

I thank you.

It is now my duty and pleasure to thank the retiring President, Al Fortmann, for his outstanding handling of the affairs of the

AMEU during the past two years. He has always displayed great insight in his handling of all AMEU matters and has acted as an inspiration to all who have had the privilege of working with him during his term as President of the AMEU. Your pleasant and precise manner of conducting meetings enhanced the effectiveness of the Committees working.

Ook die wyse waarop hy die verrigtinge tydens die 50ste Konvensie en die 12de Tegniese Vergadering in Potchefstroom, asook tydens vergaderings van die Uitvoerende Raad hanteer het, het vir my as voorbeeld gedien en ek het eers onlangs begin besef hoeveel werk en tyd daaraan bestee is.

Danksy 'n belangrike voorwaarde in die Grondwet van die Vereniging sal sy ondervinding en kennis altyd vir hierdie instansie behou bly en ek sal persoonlik dankbaar wees vir sy voortgesette leiding die volgende twee jaar gedurende sy amp as pas-uitgetrede President. Uit erkentlikheid vir sy diens aan die VME0 is dit vir my 'n voorreg om hierdie welverdiende huldeskrif aan hom te oorhandig.

Alwin, ek hoop dat hierdie huldeskrif jou altyd sal herinner aan die jare wat jy saam met jou vriende in die munisipale diens verkeer het en ook vreugde sal verskaf en as 'n herinnering sal dien.

Ek vra jou nou om hierdie huldeskrif in ontvangs te neem. Dit lees soos volg:

"This certificate is presented in grateful recognition to Alwin Hartwig Ludwig Fortmann for the dignified and inspiring manner in which he has fulfilled the high office of President of the Association of Municipal Electricity Undertakings of South Africa for the period 1987 to 1989 and in recognition of his unselfish efforts in promoting and furthering the objects of the Association presented by the Association of Municipal Electricity Undertakings of South Africa on the 2nd October 1989 at Cape Town."

Mr Fortmann our very best wishes.

## VALEDICTORY PRESIDENTIAL ADDRESS

A H L FORTMANN Pr Eng

### I. INTRODUCTION

As President of the AMEU it is a very pleasant privilege and honour for me to be able to welcome you to the 51st AMEU Convention, here in Cape Town.

Most delegates present here will recall that I presented my Presidential Address, titled "Focus On Productivity And The Municipal Electrical Engineer", after being inducted as President at the 50th Convention in 1987, here at the same venue.

To relieve the incoming President of the pressure of having to prepare a Presidential Address as well as organising the Convention — it is customary for the AMEU incoming President to organise and host the Convention at which he is inducted and which is at the commencement of his term of office, the AMEU Executive Council resolved to rearrange this custom so that the Presidential Address is delivered at the end of his term of office.

This is to the best of my knowledge the practice with most, if not all the other Municipal Institutes.

The result of this action is that I am required to deliver two Addresses during my term of office.

However, instead of a "traditional" type of Presidential Address, where some or other particular subject is addressed, this one will be in the form of a Valedictory Address.

## PRESIDENSIËLE AFSKEIDS-BOODSKAP

A H L FORTMANN Pr Ing

### I. INLEIDING

As President van die VME0 is dit vir my 'n baie aangename voorreg en eer om almal hier teenwoordig, na die 51ste VME0-konvensie hier in Kaapstad, welkom te heet.

Meeste van die afgevaardigdes hier sal onthou dat ek my Presidensrede, getiteld "Fokus Op Produktiwiteit En Die Munisipale Elektrotegniese Ingenieur", nadat ek by die 50ste Konvensie in 1987 as President ingehuldig is, gelewer het.

Om die inkomende President van die druk met die opstel van 'n Presidensrede, sowel as die organisering van die Konvensie te help verlig is dit gebruiklik vir die inkomende President van die VME0 om die Konvensie te organiseer en as gasheer op te tree, waartydens hy ingehuldig word en dit sy aanvang van sy ampstermyn is, het die VME0 Uitvoerende Raad besluit om hierdie gebruik te wysig sodat die Presidensrede aan die einde van sy ampstermyn gelewer word.

Dit is na die beste van my wete by die meeste, indien nie by al die ander Munisipale Institute nie, die gebruik.

Die gevolg van hierdie aksie is dat ek twee Presidensredes gedurende my ampstermyn moet lewer.

Maar in plaas daarvan dat ek 'n "tradisionele" Presidensrede, waar een of ander besondere onderwerp behandeling word, lewer, sal hierdie een in die vorm van 'n afskeidsboodskap wees.

The AMEU Convention is the pinnacle of its activities, where all its members from far and wide have the opportunity of meeting, listening to formal contributions from experts in their fields and to exchange views and opinions with each other and to renew friendships.

The social side is of course not forgotten and I have often heard it said that the AMEU Conventions are supreme in this regard. Without wanting to appear boastful and with apologies to our good friends present from the other Municipal Institutes, I agree wholeheartedly with these sentiments, as I am sure you, the delegates, will.

## 2. THEME OF THE CONGRESS

For as long as I can remember, the AMEU has not had themes for its Conventions, but for the 51st Convention, the Executive Council decided on a theme, namely "Electricity Supply Quo Vadis?"

Normally in the past, the title of the Presidential Address formed the basis for Conventions.

The question of "where we are going" with electricity supply, is very appropriate and a number of the Papers to be delivered over the next few days will, I am certain, shed some light on this aspect.

The world around us and with it the electricity supply industry is constantly on the move. This obviously is a healthy situation, as anything that stagnates, decays. No sooner has a challenge been overcome when new challenges appear and sometimes these new challenges seem far greater than previous ones. One needs only to look at the clamour for electricity in homes for lighting, cooking and heating and the millions of our population who do not have this service — what a challenge to our electricity supply industry.

## 3. THE IMAGE OF THE AMEU

We, the members of the Association Of Municipal Electricity Undertakings of South Africa know and are proud of this organisation and its aims and objectives. It is however very important that we project the AMEU's image, of which we are justly proud, to the world outside. If we exist to serve, we must not only serve our own circle of members, but also those further afield. To be able to do this, we must be known and one way of doing this is to keep in contact with our sister Institutes and other organisations and to participate in their activities, wherever possible.

The AMEU is the mouthpiece of the municipal electrical engineer and as such of the electric utilities in South Africa.

I have listed, in the schedule attached to this address, some of the activities, such as conventions, meetings and functions, I as President or someone from the ranks of the AMEU on my behalf, had the privilege of attending.

Hopefully this contributed to making the AMEU better known and to improving its image and of course for our Association to also have benefitted from these contacts.

I would like to place on record my warm gratitude to the AMEU in allowing me and the other members I enlisted to assist, to perform this very pleasant duty of serving the AMEU in this way.

I do not intend to read the contents of the schedule as this will probably make boring reading, except perhaps to highlight one or two items.

In any event, the schedule is there for the record for anyone to read, who so desires.

In the schedule of activities, I would like to stress the importance of attending conferences of our sister institutes. Where I as President could not attend I enlisted someone from the AMEU to attend on my and the AMEU's behalf.

The attendance of prize-giving ceremonies to apprentices, is I believe most important. It may mean a fair amount of travel and cost to the AMEU but is a most valuable exercise for both the receiver of a prize and the presenter, the AMEU. The presence of an AMEU representative at such functions lends

the VMEO-konvensie is die hoogtepunt van sy aktiwiteite, waar al die lede van heinde en ver die geleentheid het om saam te vergader, te luister na formele bydraes deur kenners op hul gebied en om gedagtes en sienings met mekaar te wissel en om vriendskapsbande te hernu.

Die sosiale sy word natuurlik nie agterwoë gelaat nie en ek het al telkemale gehoor dat die VMEO-konvensies uitstaande in hierdie opsig is. Sonder om grootpraterig voor te kom en met verwysing aan ons goeie vriende van ander Munisipale verenigings wat hier teenwoordig is, stem ek heelhartig met hierdie mening saam, soos ek seker is u as afgevaardigdes ook sal saamstem.

## 2. TEMA VAN DIE KONGRES

Vir solank ek kan onthou, het die VMEO nie temas vir sy Konvensies gehad nie, maar met die 51ste Konvensie, het die Uitvoerende Raad eger op 'n tema besluit, naamlik "Elektrisiteitsvoorsiening Quo Vadis?".

In die verlede was dit gewoonlik die titel van die Presidentsrede wat die basis vir konvensies gevorm het.

Die vraag "waarheen ons op pad is" met elektrisiteitsvoorsiening, is baie gepas en 'n aantal van die referate wat oor die volgende paar dae gelewer gaan word, is ek seker, sal lig op hierdie aspek werp.

Die wêreld rondom ons en daarmee saam die elektrisiteitsvoorsieningswyerheid is voortdurend aan die beweging. Dit is duidelik 'n gesonde situasie, omdat alles wat stagneer, vergaan. Skaars word 'n uitdaging oorbrug, of nuwe uitdaging verskyn wat veel groter as vorige blyk te wees. 'n Mens hoef net na die aanvraag vir elektrisiteit in huise vir beligting, kook en verwarming te kyk en na die miljoene mense van ons bevolking wat nie elektrisiteit het nie om te besef hoe 'n uitdaging dit vir ons elektrisiteitsvoorsieningswyerheid is.

## 3. DIE BEELD VAN DIE VMEO

Ons, die lede van die Vereniging van Munisipale Elektrisiteitsondernemings van Suid-Afrika weet en is trots op hierdie organisasie met sy mikpunt en doelwitte. Dit is intendeel baie belangrik dat ons die VMEO se beeld, waarop ons baie trots is, na die wêreld daar buite uitbou. Ons bestaan om te dien, daarom moet ons nie net ons eie kring mens bedien nie, maar ook wyer uitkring. Om dit te kan vermag, moet ons bekend wees en een manier om dit te kan doen is om met ons mede-institute en ander organisasies in kontak te bly en waar moontlik, aan hulle aktiwiteite deel te neem.

Die VMEO is die spreekbuis van die munisipale elektrotegniese ingenieur en as sulks van die elektriese ondernemings in Suid-Afrika.

Ek het in die bylae wat by my boodskap aangeheg is, sekere van die aktiwiteite, soos konvensies, vergaderings en funksies wat ek as President of wat namens my deur iemand uit die gelede van die VMEO, bygewoon is, gelys.

Hopelik het hierdie verbintenisse bygedra om die VMEO beter bekend te maak, om sy beeld te verbeter en natuurlik het ons Vereniging ook daarby gebaat.

Ek wil graag my opregte dank aan die VMEO uitspreek vir die geleentheid wat ek en ander lede wat my bygestaan het, gebied is om hierdie aangename taak van dienslewering aan die VMEO te kon verrig.

Ek is nie van voornemens om die inhoud van die skedule vir u te lees nie, aangesien dit dalk te eentonig sal wees, behalwe om miskien hier en daar een of twee hoogtepunte uit te lig.

Die skedule is in elk geval beskikbaar vir enigiemand wat dit sou verkies, om dit te lees.

In die jaarprogram van aktiwiteite, wil ek graag die belangrikheid om die konferensies van ons mede-institute by te woon, beklemtoon. Waar ek as President dit nie kon bywoon nie, het ek iemand van die VMEO aangewys om namens my en die VMEO dit by te woon.

Die prysuitdelingsceremonies van vakleerlinge, glo ek, is baie be-

prestige to it and in the process the AMEU's name is publicised to all those present at these functions.

It must be pointed out that besides the activities and formal functions listed, your President was involved in many more events, by way of meetings, correspondence and so on, with many of these effectively promoting the AMEU's standing and to becoming known as an organisation which is willing to assist and serve others.

An important development for municipal engineering of all disciplines, something which is probably unique among municipal organisations, was the establishment of a Liaison Committee to co-ordinate action on matters of mutual interest to electrical and civil engineers in local government service.

Under the guidance of the Presidents of the two societies, namely the AMEU and IMESA (Institution of Municipal Engineers of Southern Africa) the committee held its first meeting in October 1988.

At this meeting it was unanimously decided to back an initial approach by the Institution of Municipal Engineers of Southern Africa for an additional (second) representative on the Engineering Council, which Council is proposed under the Draft Engineering Profession of South Africa Bill.

Letters, motivating the request, were written by both Presidents to the Department of Public Works and Land Affairs, which is responsible for the legislation and were favourably received.

The purpose of this proposal is to enable the Minister to appoint a representative from the ranks of engineers in municipal service, thereby recognising the part played by the third tier of government, the width of professional services rendered, the contribution made to planning, providing, operating and maintaining of essential services and infrastructure and the training of professional staff.

The liaison is continuing and the committee members are optimistic that the new approach to all matters of common concern will bring benefits to local government, the engineering profession and in turn to individual engineers.

I would like to express my gratitude to Mr Graham Keppie, who was President of IMESA, when contact was established between the AMEU and IMESA and I hope and trust that this association will continue with Mr Hennie Botha, the new President in the chair.

The AMEU is also deeply involved with Eskom in marketing electricity under a committee referred to as the Product Promotion Committee. The idea of marketing electricity is to get the public, commerce and industry to "think electricity" but at the same time to use electricity more productively.

The Electricity Supply Industry is dominated by two major partners being Eskom and the Association of Municipal Electricity Undertakings but the Electricity Supply Industry lacks unity in purpose and direction. The campaign will focus on the product electricity and not on the manufacturer or distributor. It is therefore not even intended to use the Eskom or AMEU logos; the campaign embraces the whole Electricity Supply Industry.

#### 5. AMEU COMMITTEES

The day after the conclusion of the biennial conventions, where new Executive Councils are elected, the Executive Council inter alia, appoints numerous committees.

During this past two-year term the following Committees were in operation.

1. STANDING COMMITTEE
2. PAPERS COMMITTEE
3. FINANCE COMMITTEE
4. RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES
5. ELECTRICITY SUPPLY COMMITTEE
6. SABS CO-ORDINATING COMMITTEE
7. TECHNICAL TRAINING COMMITTEE
8. SATEPSA MAIN POWER SUBCOMMITTEE
9. PUBLICITY
10. HIGH VOLTAGE CO-ORDINATING COMMITTEE

langrik om by te woon. Dit mag beteken dat heelwat gereis moet word, sowel as aansienlike kostes vir die VMEO, maar dit is beslis die moeite werd vir sowel die ontvanger van die prys, en die aanbieder — die VMEO. Die teenwoordigheid van 'n VMEO-verteenwoordiger gee aansien aan hierdie funksies en in die proses word die VMEO se naam aan almal wat by hierdie funksies teenwoordig is, bekend.

Dit moet daarop gewys word dat behalwe die aktiwiteite en formele funksies wat in die bylae verskyn, u President betrokke was by menige ander aktiwiteite, by wyse van vergaderings, korrespondensie, ens., waar vele van hierdie bygedra het om die VMEO se beeld te bevorder en om as 'n organisasie bekend te word wat bereid is om te help en om diens aan andere te lewer.

'n Belangrike ontwikkeling vir munisipale ingenieurswese, iets wat moontlik onder munisipale organisasies uniek is, was die totstandkoming van 'n Skakelkomitee wat oor sake van gemeenskaplike belang tussen elektrotegniese en siviele ingenieurs in plaaslike bestuur sal saamwerk.

Onder die leiding van die Presidente van die twee verenigings, die VMEO en IMISA (Instituut van Munisipale Ingenieurs van Suidelike Afrika) het die komitee sy eerste vergadering gedurende Oktober 1988 gehou.

By hierdie vergadering is eenparig besluit om as die eerste stap wat deur die Instituut van Munisipale Ingenieurs van Suidelike Afrika geneem word 'n addisionele (tweede) verteenwoordiger op die Ingenieursraad te verkry, waar hierdie raad voorgestel word in die Konsepwetsontwerp op die Ingenieursberoep van Suid-Afrika.

Briewe wat die versoek motiveer, is deur beidePresidente aan die Departement van Openbare Werke en Grondskade, wat vir die wetgewing verantwoordelik is, geskryf en is gunstig deur hulle ontvang.

Die doel van hierdie voorstel is om die Minister in staat te stel om 'n verteenwoordiger uit die beroep van ingenieurs in munisipale diens aan te stel, waardeur erkenning gegee word aan die rol wat derde vlak regering speel, die omvang van professionele dienste wat gelewer word, die bydrae wat tot beplanning gemaak word, die voorsiening, bedryf en instandhouding van noodsaaklike dienste en infrastruktuur en die opleiding van professionele personeel.

Die skakelwerk gaan voort en die komiteede is optimisties dat die nuwe benadering tenoor alle sake van gemeenskaplike belang, voordeel aan plaaslike bestuur, die ingenieursprofessie en op sy beurt aan individuele ingenieurs, sal bring.

Ek wil graag my dank aan mnr Graham Keppie, wat President van IMISA was, toe kontak tussen die VMEO en IMISA moontlik gemaak was, oordra en ek glo en vertrou dat hierdie samewerking met mnr Hennie Botha, die nuwe President in die stoel, sal voortduur.

Die VMEO is ook diep betrokke by Eskom in die hantering van elektrisiteit onder 'n komitee wat as die Produk Promosiekomitee, bekend staan. Die idee om elektrisiteit te bemark is om die publiek, handel en nywerheid te beweeg om "elektrisiteit te dink", maar terselfdertyd elektrisiteit meer produktief te gebruik.

Die Elektrisiteitsvoorsieningsnywerheid word deur twee groot organisasies, naamlik Eskom en die VMEO oorheers, maar die Elektrisiteitsvoorsieningsnywerheid kort 'n doel en rigting. Die veldtog sal op die produk elektrisiteit fokus en nie op die vervaardiger of verspreider nie. Dit is daarom nie beoog om die tekens van of Eskom of die VMEO te gebruik nie; die veldtog sluit die hele Elektrisiteitsvoorsieningsnywerheid in.

#### 4. VMEO-KOMITEES

Die dag na afloop van die tweejaarlike konvensies, waar 'n nuwe Uitvoerende Raad verkies word, stel die nuwe Uitvoerende Raad, onder andere, verskeie komitees aan.

Gedurende die afgelope twee jaar termyn was die volgende komitees in werking.

1. DAGBESTUUR
2. REFERATEKOMITEE

11. WORLD ENERGY CONFERENCE
12. ELECTROLYTIC CORROSION COMMITTEES
- 12.1 MAIN COMMITTEE
- 12.2 WITWATERSRAND REGION
- 12.3 NATAL REGION
- 12.4 NORTHERN CAPE REGION
- 12.5 WESTERN CAPE REGION
- 12.6 EASTERN CAPE REGION
13. AMEU/ECA/ESKOM LIAISON COMMITTEE
14. THE NBRI STEERING COMMITTEE ON SOLAR ENERGY AND ENERGY CONSERVATION IN BUILDINGS AND BUILT ENVIRONMENT
15. CSIR/NEERI ADVISORY COMMITTEE
16. SANCI
17. AMEU/ILESA/SANCI STREET LIGHT ADVISORY COMMITTEE
18. S A NATIONAL COMMITTEE OF THE IEC
19. NEERI POWER SUB-COMMITTEE
20. COMMITTEE: STATUTORY REGULATIONS
21. TRAINING COUNCIL: LOCAL GOVERNMENT TRAINING ACT, NO 41 OF 1985:
- 21.1 NATIONAL CO-ORDINATING TRAINING COMMITTEE
22. STATUS OF THE CITY AND TOWN ELECTRICAL ENGINEER (AD-HOC)
23. AMEU SUB-COMMITTEE: REVISION OF PART G OF THE GUIDELINES FOR THE PROVISION OF ENGINEERING SERVICES IN RESIDENTIAL TOWNSHIPS
3. FINANSKOMITEE
4. AANBEVELINGSKOMITEE VIR NUWE ELEKTRIESE VERBRUIKSWARE
5. ELEKTRISITEITSVOORSIENINGSKOMITEE
7. TEGNIESE OPLEIDING
8. SATEKG HOOF-KRAGONDERKOMITEE
9. PUBLISITEIT
10. KOÖRDINERENDE HOOGSPANNINGSKOMITEE
11. WERELDKRAGBRONKONFERENSIE
12. ELEKTROLITIESE KORROSIE
- 12.1 HOOFKOMITEE
- 12.2 WITWATERSRANDSE STREEK
- 12.3 NATALSTREEK
- 12.4 NOORD-KAAPLANDSE STREEK
- 12.5 WES-KAAPLANDSE STREEK
- 12.6 OOS-KAAPLANDSE STREEK
13. VME0/EKV/Eskom SKAKELKOMITEE
14. DIE NBNI LOODSKOMITEE OOR SONENERGIE EN ENERGIEBEWARING IN GEBOUE EN DIE BEBOUDE GEBIEDE
15. WNNR/NEEI-ADVIESKOMITEE
16. SANKV
17. VME0/IVISA/SANKV-STRAATLIGADVIESKOMITEE
18. S A NASIONALE KOMITEE VAN DIE IEK
19. NNEI-KRAGONDERKOMITEE
20. KOMITEE: STATUTÊRE REGULASIES
21. OPLEIDINGSRAAD: WET OP PLAASLIKE OWERHEIDSOPLÉIDING, NO. 41 VAN 1984:
- 21.1 NASIONALE KOÖRDINERENDE OPLEIDINGSKOMITEE
22. STATUS VAN DIE ELEKTROTEGNIËSE STADS-INGENIEUR (AD HOC)
23. VME0 SUBKOMITEE: HERSIENING VAN DEEL G VAN DIE RIGLYNE VIR DIE VOORSIENING VAN INGENIEURSDIENSTE IN WOONGEBIEDE

It is here where the bulk of the Executive Council's activities take place. I can assure you, Ladies and Gentlemen, that an enormous amount of work is done by these Committees and we are deeply indebted to the members on these Committees for their untiring and unstinting service they have rendered to the AMEU.

Without detracting from the importance of any other Committee, I would like to refer to one or two of these.

The Electricity Supply Committee, of which Mr Piet Botes is the Convener, has made invaluable contributions to matters concerning electricity supply in general, but particularly on issues pertaining to ESKOM and the AMEU.

I have attended one or two of these Committee meetings and can therefore better appreciate its significance.

The SABS Co-ordinating Committee under the leadership of Mr Attie v d Berg, has to co-ordinate the workings of the numerous SABS Committees on standard specifications. Without this Committee I cannot imagine the smooth working of the SABS Committees on which AMEU members serve, if indeed they would function at all, certainly as far as the AMEU is concerned.

The Technical Training Committee, with Mr John Dawson as Convener, has inter alia, as one of its important tasks, that of allocating bursaries to university electrical engineering students.

Mr Jan Loubser is the representative on the National Co-ordinating Training Committee in terms of the Local Government Training Act, Act No 41 of 1985.

This is a relatively young Committee and has as its prime objective, at least at this early stage, the interests of Apprentice training at heart.

I cannot imagine the Executive Council functioning effectively without the input of all these Working Committees.

This methodology, of course, makes the task of the President, who has to chair the Executive Council and Standing Committee Meetings, so much easier. It is here where these Working Committees report.

## 5. AMEU BRANCHES

The five Branches of the AMEU hold regular meetings and are flourishing. During my term of Office, I, accompanied by my wife Joy, had the privilege and pleasure of visiting each one of these Branches.

Dit is hier waar die meeste van die Uitvoerende Raad se aktiwiteite plaasvind. Ek kan u verseker, dames en here, enorme werk word deur hierdie komitees verrig en is ons die lede wat op hierdie komitees dien, vir hulle onbaatsugtige diens wat hulle vir die VME0 verrig het, baie groot dank verskuldig.

Sonder om enigens van die belangrikheid van enige van die ander komitees afbreuk te doen, sal ek graag na een of twee verwys.

Die elektrisiteitsvoorsieningskomitee, waarvan mnr Piet Botes die sameroeper is, het waardevolle bydraes oor sake betreffende elektrisiteitsvoorsiening in die algemeen gemaak, maar in besonder oor sake aangaande Eskom en die VME0.

Ek het een of twee van hierdie komiteevergaderings bygewoon en kan derhalwe die komitee se waarde beter waardeer.

Die SABS Koördinerende Komitee onder leierskap van mnr Attie v d Berg is verantwoordelik vir die goeie werking van die menige SABS komitees vir standaard spesifikasies. Sonder hierdie komitee kan ek my nie voorstel dat die SABS komitees, waarop VME0 lede dien, glad sal kan werk nie, as hulle enigens sal kan werk, in elk geval sower dit die VME0 aangaan.

Die Tegniese Opleidingskomitee met mnr John Dawson as saamroeper het onder meer as een van sy belangrike taak, die toekening van bourse aan universiteitstudente in elektrotegniese ingenieurswese.

Mnr Jan Loubser is die verteenwoordiger op die Nasionale Koördinerende Opleidingskomitee onder die Wet op Plaaslike Owerheidsopleiding, Nr. 41 van 1985.

Hierdie komitee is betreklik jonk en sy primêre doelstelling, minstens op hierdie vroeë tydspan, is die opleiding van vakleerlinge.

Ek kan my nie voorstel dat die Uitvoerende Raad sonder die insette van al hierdie komitees behoorlik sal funksioneer nie.

Hierdie metode maak natuurlik die taak van die President, wat as voorsitter by die Uitvoerende Raad- en Dagbestuursvergaderings moet optree, soveel makliker. Dit is hier waar hierdie komitees oor hulle werksaamhede moet verslag doen.

I would like to record my sincere gratitude to the Executive and Members of the Branches for making my visits such memorable ones.

Without the Branches, the AMEU would just not be what it is. Many of the matters that the Executive Council and the main body of the AMEU, which meets at national conventions and technical meetings, handle, have their origins at Branch level. At the Branch meetings, there is participation in discussions by members who may shy away from participation in discussions at national convention level. The Branches therefore play an important role in this Association.

#### 6. EXPRESSION OF GRATITUDE

Mr Mayor, Ladies and Gentlemen, my two years in Office as President has been a great privilege and a most rewarding experience.

I would like to thank sincerely, the Councillor and Engineer members of the Executive Council for the hard work and loyal support they have given me. It was extremely gratifying to have had the knowledge and assurance of the constant backing of the Executive Council, who would so willingly share my problems and burdens.

To the Executive Council and its numerous committees I would like to thank most sincerely for all their hard work and loyal support. I can assure you that these committees don't only work hard but that they also achieve a great deal. Although the Executive Council has the final say on most of their activities, it is these committees that do the nitty gritty of the AMEU functions. You have received copies of the reports from the various committees, from which you can glean the magnitude of their activities.

A man we constantly turn to for assistance, is our Secretary, Mr Bennie v d Walt. I think Bennie and I hit it off very well and I would like to thank him most sincerely for his guidance and support. Bennie, thank you for everything you have done for me and to you and Annatjie for your friendship towards Joy and I.

The position of Technical Secretary has come into being and as most of you are aware, was filled by Mr Jules von Ahlfen. Jules needs no introduction and I can say that Jules is fully in the saddle attending to the many technical aspects of the AMEU. Jules, for your always willing assistance I would like to extend a hearty thank you. I am sure that you will become an institution as Technical Secretary as you were as an Engineer Member.

To Mr Max Clarke, editor of our newsletter, AMEU News, I would like to express our deepest gratitude for the wonderful work you have done in running the AMEU Newsletter. Max, you are doing a great job, thank you.

One of the pillars of the AMEU is made up of the Affiliate Members. This unique association the AMEU has with the Affiliates works exceedingly well.

To Mr Brian Madeley and his team I extend a special welcome and thank you for your valued support.

To my wife Joy I would like to say a very big thank you — your participation in many of my duties, your support and encouragement are highly appreciated. It is your love and affection which has always been with me.

Last but not least, my sincere gratitude to my own Town Council who made it possible for me to assume the Office of President, as well as colleagues in my Department and here I must record the name of my Secretary, Mrs Salomé Goosen, who was my right hand in so much of the organising. I would also like to record my sincere thanks to my previous Councillor, the then Alderman Ben Steyn and Sally his wife and more recently, my present Councillor, Councillor Charles Hawkins and his wife Annemarie, for their valued support.

It was indeed an honour and privilege to have served you.

#### 5. VMEO-TAKKE

Die vyf Takke van die VMEO hou gereeld vergaderings en gaan pragtig vooruit. Gedurende my ampstermyn het ek, vergesed deur my gade Joy, die voorreg gehad om elk van hierdie Takke te besoek.

Graag wil ek my hartlike dank en waardering aan die bestuur en lede van die Takke betuig, wat my besoek aan hulle so aangenaam gemaak het.

Sonder hierdie Takke, sou die VMEO nie gewees het wat dit is nie. Baie van die sake wat die Uitvoerende Raad en die hoofligaam van die VMEO, wat byeenkom by nasionale konvensies en tegniese vergaderings, hanteer, het hulle oorsprong by die Takke. By die Takvergaderings is daar deelname aan die besprekings deur lede wat miskien nie aan besprekings op konvensievlak sal deelneem nie. Die Takke speel dus 'n belangrike rol in die Vereniging.

#### 6. UITDRUKKING VAN DANKBAARHEID

Mnr die Burgemeester, dames en here, my twee jaar in die amp as President was 'n baie groot voorreg en 'n lonende ondervinding.

Ek wil graag die Raadslede en Ingenieurslede van die Uitvoerende Raad hartlik bedank vir die harde werk en lojale bystand wat hulle aan my gegee het. Dit was besonder bevredigend om die wete en versekering te kon hê dat ek die getroue ondersteuning van die Uitvoerende Raad, wat bereid was om my probleme en laste met gewilligheid met my te deel, gehad het.

Die Uitvoerende Raad en sy baie komitees wil ek ook hartlik bedank vir al hulle harde werk en lojale ondersteuning. Ek kan u verseker dat hierdie komitees nie net hard werk nie, maar dat hulle ook baie bereik. Alhoewel die Uitvoerende Raad die finale sê oor die meeste van hierdie komitees se werksaamhede het, is dit hierdie komitees wat eintlik die take van die VMEO verrig. U het afskrifte van die verslae van die verskeie komitees ontvang, waaruit u die omvang van hulle aktiwiteite kan bepaal.

'n Man wie se bystand gereeld gesoek word, is ons Sekretaris, mnr Bennie v d Walt. Ek dink dat Bennie en ek baie goed saam gewerk het en wil hom dan ook hartlik bedank vir sy leiding en bystand. Bennie, baie dankie vir alles wat jy vir my gedoen het en vir jou en Annetjie se vriendskap teenoor my en Joy.

Die posisie van Tegniese Sekretaris is geskep en soos meeste van u bewus is, is die pos deur mnr Jules von Ahlfen gevul. Jules het geen bekendstelling nodig nie en ek kan net sê dat Jules ten volle in die saal is met al die tegniese aspekte van die VMEO. Jules, vir jou bereidwilligheid om ten alle tye behulpsaam te wees, wil ek graag aan jou my hartlike dank oordra.

Aan mnr Max Clarke, redakteur van ons nuusbrief, VMEO Nuus, wil ek graag my diepste dankbaarheid oordra vir die wonderlike werk wat jy in die VMEO Nuusbrief insit. Max, jy doen 'n pragtige werk, dankie.

Een van die steunpilare van die VMEO is die Geaffilieerde Lede. Hierdie unieke genootskap wat die VMEO met die Geaffilieerdes het, is uiters geslaagd.

Aan mnr Brian Madeley en sy span wil ek 'n spesiale verwelkoming toeroep en dankie sê vir julle waardevolle ondersteuning.

Aan my eggenote Joy, vir jou wil ek baie dankie sê — jou deelname aan baie van my pligte, jou bystand en aansporing word hoog op prys gestel. Dit is jou liefde wat altyd by my was.

Laaste maar nie die minste nie, my opregte dank aan my eie Stadsraad wat dit vir my moontlik gemaak het om die amp van President te kon beklee, sowel as kollegas in my Department en hier wil ek graag die naam van my Sekretaris, mev Salomé Goosen, wat as 't ware my regterhand met baie van die reëlings was, noem. Ek wil ook my opregte dank aan my vorige Raadslid, Raadsheer Ben Steyn en Sally sy gade oordra en aan my huidige Raadslid, Raadslid Charles Hawkins en sy gade Annemarie, vir hulle waardevolle bystand.

Dit was inderdaad 'n voorreg om u te kon dien.

**SCHEDULE OF CONVENTIONS, MEETINGS, FUNCTIONS, ETC., ATTENDED BY THE PRESIDENT OR SOMEONE ELSE ON HIS BEHALF:**

**A H L FORTMANN: TERM OF OFFICE**  
**28 SEPTEMBER 1987 TO 1 OCTOBER 1989:**

Following is a schedule of conventions, functions, meetings, etc., which the President or someone on his behalf attended during the term of office mentioned.

I would like to place on record my warm gratitude to the AMEU in allowing me and the other members I enlisted to assist, to perform this very pleasant duty of serving the AMEU in this way.

- The Institute of Municipal Treasurers and Accountants Conference in Durban from 27 to 29 October 1987 which was attended by Mr Denis Fraser, then City Electrical Engineer of Durban.
- The 82nd Orange Free State Municipal Association Conference in Kroonstad: 5 & 6 November 1987 — Attended by Dr Nico Botha, President-Elect and City Electrical Engineer of Bloemfontein at the time.
- The Associated Scientific And Technical Societies of South Africa: Annual General Meeting and induction of new President, Mr D H Mills on 25 November 1987 followed by a cocktail-party — Attended by A H L Fortmann, President.
- The Federation of Societies of Professional Engineers Award Ceremony and Luncheon at the Johannesburg Country Club on Wednesday 27 January 1988. Award for services to the engineering profession to Dr Francis George Hill — Attended by A H L Fortmann, President.
- The Municipal Association of Transvaal Executive Committee Meeting on 20 February 1988 in the Civic Centre, Johannesburg — Attended by A H L Fortmann, President.
- The S A Institute for Organisation and Methods — Seminar at Warmbaths, held on 18 and 19 February 1988 — Attended by Mr K Lochner, Town Electrical Engineer, Pietersburg.
- South-African Fire Institute: 18th National Congress and Institute meeting at Roodepoot from 24 to 26 February 1988, attended by Mr A H L Fortmann, President.
- The Institute of Municipal Personnel Practitioners of Southern Africa: Seminar at the Elgro Hotel in Potchefstroom: 21 and 22 April 1988 — Attended by A H L Fortmann, President.
- The Institution of Municipal Engineers of Southern Africa: (Civil): 58th Conference: 16 to 19 May 1988: East London — Attended by Dr Nico Botha, President-Elect and City Electrical Engineer of Bloemfontein at the time.
- (The Associated Scientific And Technical Societies Of South Africa): Syllabus for mathematics: Standards 5 to 7: Possible revision: Meeting on 4 May 1988 attended by Mr M J Human, Town Electrical Engineer, Brakpan.  
General comment was that the method of teaching should be looked at and that mathematics should be taught more practically.
- Presentation of R250 AMEU award on 13 May 1988, to the best apprentice at the Pretoria Training Centre — Attended by A H L Fortmann, President.
- Presentation of R250 AMEU award on 25 May 1988, to Mr Bruce Taylor, as best apprentice at the Durban Training Centre — Attended by A H L Fortmann, President.
- Farewell function on 14 June 1988 at the Municipal Association of Transvaal for Mr W Cruywagen, at the time of his retirement — Attended by Mr and Mrs Bennie v d Walt and Mr and Mrs A H L Fortmann.
- Central Statistical Services: Technical Advisory Committee: Electricity and Steam: 1989: Meeting in connection with the complement of a questionnaire held on 16 June 1988 in Pretoria — Attended by Mr M J Human, Town Electrical Engineer, Brakpan.
- AMEU Eastern Cape branch meeting in Grahamstown, on 23 and 24 June 1988, attended by A H L Fortmann, President.
- The Municipal Association of Transvaal Executive Committee Meeting on 25 June 1988 in the Council Chambers, Munitoria, Pretoria — Attended by A H L Fortmann, President.

**BYLAE VAN KONGRESSE, VERGADERINGS, FUNKSIES, ENS. WAT DEUR DIE PRESIDENT OF ANDER PERSONE NAMENS HOM, BYGEWOON IS: A H L FORTMANN: AMPSTERMYN VAN 28 SEPTEMBER 1987 TOT 1 OKTOBER 1989**

Onderstaande is 'n bylae van kongresse, vergaderings, funksies ens. wat die President, of iemand anders namens hom, gedurende sy ampstermy n bygewoon het.

Graag wil ek hiermee my hartlike dank aan die VMEO betuig, deur my en ander lede wie se hulp ek verkry het, vergunning te verleen om hierdie baie aangename taak om die VMEO op hierdie wyse te kon dien, te kon uitvoer.

- Die Instituut van Munisipale Tesouriers en Rekenmeesters se Konvensie in Durban vanaf 27 tot 29 Oktober 1987, wat deur mnr Denis Fraser, destydse Elektrotegniese Stadsingenieur van Durban bygewoon is.
  - Die 82ste Oranje Vrystaat Munisipale Vereniging se Konvensie het in Kroonstad, 5 & 6 November 1987 plaasgevind — Deur Dr Nico Botha, Aangewese-President, en Elektrotegniese Stadsingenieur van Bloemfontein, in daardie stadium, bygewoon.
  - Die Geassosieerde Wetenskaplike en Tegniese Vereniging van Suid-Afrika: Algemene Jaarlikse Vergadering en inhuulding van nuwe President, mnr D H Mills op 25 November 1987 gevolg deur 'n skemerkelkparty — Deur mnr A H L Fortmann, President, bygewoon.
  - Die Federasie van Verenigings van Professionele Ingenieurs Toekenningsseremonie en Middagete by die Johannesburg Buitekлуб op Woensdag 27 Januarie 1988. Toekening vir dienste aan die ingenieursprofessie aan Dr Francis George Hill — Deur mnr A H L Fortmann, President bygewoon.
  - Die Munisipale Vereniging van Transvaal se Uitvoerende Komiteevergadering op 20 Februarie 1988 in die Burgerentrum, Johannesburg — Deur A H L Fortmann, President bygewoon.
  - Die S A Instituut vir Organisasie en Metode — Seminar te Warmbad, gehou op 18 & 19 Februarie 1988 — Deur mnr K Lochner, ESI, Pietersburg bygewoon.
  - Suid-Afrikaanse Brandweer Instituut: 18de Nasionale Kongres en Instituutraad vergadering te Roodepoot vanaf 24 tot 26 Februarie 1988 — Deur A H L Fortmann President, bygewoon.
  - Die Instituut van Munisipale Personeel Praktisyns van Suid-Afrika: Seminar by die Elgro Hotel in Potchefstroom: 21 en 22 April 1988 — Deur A H L Fortmann, President bygewoon.
  - Die Instituut van Munisipale Ingenieurs van Suid-Afrika: (Siviel): 58ste Konvensie: 16 tot 19 Mei 1988: Oos London — Deur Dr Nico Botha, Aangewese President en destydse Elektrotegniese Stadsingenieur van Bloemfontein, bygewoon.
  - Die Geassosieerde Wetenskaplike en Tegniese Vereniging van Suid-Afrika: Silabus vir wiskunde: Standerd 5 tot 7: Moontlike hersiening: Vergadering op 4 Mei 1988 deur mnr M J Human, Elektrotegniese Stadsingenieur, Brakpan bygewoon.
- Die algemene mening was dat die metode van leer moet hersien word en dat wiskunde meer prakties moet aangebied word.
- Toekening van R250 prys vir die beste vakleerling by die opleidingsentrum in Pretoria op 13 Mei 1988 — Deur A H L Fortmann, President, bygewoon.
  - Toekening van R250 prys vir die beste vakleerling by die opleidingsentrum in Durban aan mnr Bruce Taylor op 25 Mei 1988 — deur A H L Fortmann, President bygewoon.
  - Afskeidsfunksie op 14 Junie 1988, deur die Munisipale Vereniging van Transvaal vir mnr W Cruywagen, met sy afrede en wat deur mnr en mev Bennie v d Walt en mnr en mev A H L Fortmann bygewoon is.
  - Sentrale Statistiekdiens: Tegniese Advieskomitee: Elektriesiteit, Gas en Stoom: 1989: Vergadering i.v.m. die opstel van 'n vraelys wat op 16 Junie 1988 in Pretoria gehou en deur mnr Thys Human, Elektrotegniese Stadsingenieur van Brakpan, bygewoon was.
  - Oos-Kaapland-takvergadering van die VMEO in Grahamstad, op 23 en 24 Junie 1988, deur A H L Fortmann, President bygewoon.

- Presentation of R250 AMEU award on Friday 1 July 1988, to Mr George Neervout, as best apprentice at the Johannesburg Training Centre — Attended by A H L Fortmann, President.
- The Associated Scientific And Technical Societies Of South Africa: Controlling Executive meeting on Thursday 28 July 1988 in Kelvin House — Attended by Mr Max Clarke, Town Electrical Engineer of Randburg.

The most important items for noting were as follows:-

The AGM would take place on 18 November 1988 and the presentation of the National Award will form part of the proceedings.

Professor Christo Viljoen, Stellenbosch University was organising an "Afritech 1989" meeting for 1989. All member societies were asked to supply the secretary with names and addresses of any contacts, members, etc. which they may have in African States outside of the Republic, for invitation purposes.

A new headquarters site for AS & TS is being negotiated. If the R4.5 million necessary can be obtained, the old Johannesburg "Observatory" site will be bought from the CSIR.

A "canvassing brochure" is being prepared and all Societies would be asked to approach ± 10 "top" members/organisations to obtain donations.

All societies were asked to ensure that the AS & TS Secretary is informed of dates for all main conferences, technical meetings, seminars, etc. so that these can be included in the calendar for overall planning of functions.

- Presentation of R250 AMEU award on 23 August 1988, to two apprentices — they shared the award, Messrs Mark Wentzel and Jasper de Beer, as best apprentices at the Roodepoort Training Centre — Attended by A H L Fortmann, President.
- AMEU Natal Branch meeting in Durban on 26 August 1988, attended by A H L Fortmann, President.
- The 85th Municipal Association of Transvaal Conference held in Potchefstroom on 31 August, 1 and 2 September 1988 — Attended by A H L Fortmann, President.
- The 83rd Orange Free State Municipal Association Conference held in Bloemfontein from 14 to 16 September 1988 — Attended by A H L Fortmann, President.
- The Associated Scientific And Technical Societies of South Africa: Syllabus for mathematics: Standards 8, 9 & 10: Possible revision: Meeting on 13 October 1988 attended by Mr Thys Human, Town Electrical Engineer, Brakpan.

General comment was — That the method of teaching should be looked at and that mathematics should be taught more practically and furthermore, that the different levels should be limited to only two or at the most three for example Higher and Standard grades.

- The Associated Scientific And Technical Societies Of South Africa: Controlling Executive Meeting on Thursday 27 October 1988 in Kelvin House — Attended by A H L Fortmann.
- Function organised by the ECA for the presentation of Diplomas of Electrical Contracting Management, for the first time, to ten candidates, at the Sunnyside Park Hotel in Johannesburg on Thursday 27 October 1988 — Attended by A H L Fortmann, President and Mr Bennie v d Walt, AMEU Secretary.
- The Associated Scientific And Technical Societies Of South Africa: General Meeting and induction of new President, Mr Les James, on Friday 18 November 1988 followed by a cocktail party — Attended by Mr P J Botes, Town Electrical Engineer, Roodepoort.
- The 84th Natal Municipal Association Conference held in Pietermaritzburg on 21 and 22 November 1988 — Attended by A H L Fortmann, President.
- The Federation of Societies of Professional Engineers (FSPE) Award ceremony and luncheon at the Johannesburg Country Club on 27 January 1989. The FSPE Award for Services to the Engineering Profession presented to Dr Nico Stut-

- Die Transvaal Munisipale Vereniging Komiteevergadering op 25 Junie 1988 in die Raad se vergadersaal, Pretoria gehou — Deur A H L Fortmann, President bygewoon.
- Toekening van R250 prys vir die beste vakleerling by die opleidingsentrum in Johannesburg is op 1 Julie 1988 aan mnr George Neervout toegeken — Deur A H L Fortmann, President, bygewoon.
- Die Geassosieerde Wetenskaplike en Tegniese Vereniging van Suid-Afrika: Beherende Uitvoerende vergadering op Donderdag 28 Julie 1988 te Kelvinhuis, gehou — Deur mnr Max Clarke, Elektrotegniese Stadsingenieur, Randburg, bygewoon.

Die belangrikste items vir kennisname is soos volg:-

Die AJV sal op 18 November 1988 gehou word en die toekening van die Nasionale Prys vorm deel van die verrigtinge.

Professor Christo Viljoen, Stellenbosch Universiteit het "Afritech 1989" vergadering vir 1989 georganiseer. Alle ledeverenigings is gevra om aan die sekretaris name en adresse van enige kontrakte, lede, ens. wat hulle van ander Afrika state buite die Republiek mag hê, te voorsien om uitnodigings aan te stuur.

Daar word vir 'n nuwe hoofkwartier vir die GW & TV onderhandel. Indien die R4.5 miljoen benodig kan verkry word, sal die ou Johannesburgse "Observatorium" van die WNNR gekoop word.

'n "Werwingsbrosjyre" word saamgestel om alle Verenigings en sal gevra word om ± 10 "top" lede/organisasies vir donasies te nader.

Alle Verenigings word versoek om te verseker dat die GW & TV Sekretaris van die datums van alle hoofkonferensies, tegniese vergaderings, seminare, ens., ingelig word sodat hierdie inligting volledig vir die beplanning van funksies op die kalender ingesluit kan word.

- Toekening van R250 VME0 prys op 23 Augustus 1988 aan twee vakleerlinge, mnr Mark Wentzel en Jasper de Beer, wat die toekening deel as beste vakleerlinge van die opleidingsentrum te Roodepoort — Deur A H L Fortmann, president bygewoon.
- Nattalank van die VME0-vergadering gehou op 26 Augustus 1988 te Durban, deur A H L Fortmann, President bygewoon.
- Die 85ste Munisipale Vereniging van Transvaal se Konferensie is op 31 Augustus, 1 en 2 September 1988 te Potchefstroom gehou — Deur A H L Fortmann, President bygewoon.
- Die 83ste Konferensie van die Oranje Vrystaat Munisipale Vereniging in Bloemfontein vanaf 14 tot 16 September 1988 gehou — Deur A H L Fortmann, President bygewoon.
- Die Geassosieerde Wetenskaplike en Tegniese Vereniging van Suid-Afrika: Silabus vir wiskunde: Standerds 8, 9 & 10: Moontlike hersiening: Vergadering op 13 Oktober 1988 — deur mnr Thys Human, Elektrotegniese Stadsingenieur, Brakpan, bygewoon.

Die algemene mening was dat die metode van leer moet harsien word en dat wiskunde meer prakties aangebied word en verder, dat die verskillende vlakke tot net twee of uiters drie vir Hoër en Standaardgraad beperk word.

- Die Geassosieerde Wetenskaplike en Tegniese Vereniging van Suid-Afrika: Beherende Uitvoerende vergadering op Donderdag 27 Oktober 1988 in Kelvinhuis gehou — Deur A H L Fortmann, President bygewoon.
- Funksie deur die EKV vir die eerste keer georganiseer vir die toekening van Diplomas van Elektriese Ondernemingsbestuur, aan tien kandidate, by die Sunnyside Park Hotel in Johannesburg op Donderdag 27 Oktober 1988 — Deur A H L Fortmann, President en mnr Bennie v d Walt, VME0 Sekretaris, bygewoon.
- Die Geassosieerde Wetenskaplike en Tegniese Vereniging van Suid-Afrika: Algemene Vergadering en inhuuldiging van nuwe President, mnr Les James, op Vrydag 18 November 1988 gevolg deur 'n skemerkelkparty — Deur mnr P J J Botes, Elektrotegniese Stadsingenieur, Roodepoort bygewoon.

terheim — Attended by A H L Fortmann, President.

- The Municipal Association of Transvaal Executive Committee Meeting on 25 February 1989 in the Civic Centre, Johannesburg — Attended by Mr Attie v d Berg, Town Electrical Engineer, Krugersdorp.
- The AMEU Good Hope Branch meeting held in Cape Town on 10 March 1989 — Attended by A H L Fortmann, President.
- The Associated Scientific and Technical Societies of South Africa, Controlling Executive meeting held on 27 April 1989 in the SAIEE Council Chamber, Kelvin House, Johannesburg — Attended by A H L Fortmann, President.
- The Institute of Municipal Personnel Practitioners Conference, held in Durban from 10 to 12 May 1989 — Was to have been attended by Mr F L U Daniel, President-Elect., but unfortunately circumstances barred his attendance.
- The 12th Institution of Municipal Engineers of Southern Africa Technical Meeting held in Kempton Park from 17 to 19 May 1989 — Attended by A H L Fortmann, President.
- Presentation of R250 AMEU award on 24 May 1989, to the best apprentice at the Pretoria Training Centre, Mr Steven Dave Naude — Attended by A H L Fortmann, President.
- Diploma ceremony of the Technikon RSA, in the Linder Auditorium of the Johannesburg College of Education, on Saturday 3 June 1989 — Attended by A H L Fortmann, President.
- Function of the Skills SA National Competition on House and Industrial Wiring, to choose a sector winner to go to the United Kingdom in August 1989, held at the Eskom Training College, Halfway House, on 7 June 1989 — Attended by Mr Jules von Ahlfen.
- The Institute of Town Clerks of Southern Africa: 30th Conference held in Kempton Park from 5 to 8 June 1989 — Attended by A H L Fortmann, President.
- Presentation of R250 AMEU award on 9 June 1989, to the best apprentice at the Durban Training Centre — Attended by F L U Daniel, President-Elect.
- The Municipal Association of Transvaal Executive Committee Meeting on 24 June 1989 in the Council Chamber, Munitoria, Pretoria — Attended by Mr Coen Scherman City Electrical Engineer, Pretoria.
- Presentation of R250 AMEU award on Friday 30 June 1989, to the best apprentice at the Johannesburg Training Centre — Attended by F L U Daniel, President-Elect.
- International Electrotechnical Commission (IEC) General Meeting held in Brighton, United Kingdom from 3–15 July 1989: Attended by A H L Fortmann, President and Mr Attie v d Berg, Town Electrical Engineer, Krugersdorp.
- Meeting of Presidents of Member Societies of AS & TS held on Friday 15 September 1989 in the Innis Telescope Building, Observatory site, 18A Gill Street, Observatory, Johannesburg. Attended by Mr J A Loubser, Town Electrical and Mechanical Engineer, Benoni.
- Die 84ste Konvensie van die Natal Munisipale Vereniging in Pietermaritzburg op 21 en 22 November 1988 gehou — Deur A H L Fortmann, President bygewoon.
- Die Federasie van Verenigings van Professionele Ingenieurs (FVPI) Toekenningsseremonie en middagete by die Johannesburg Bytuleklub op 27 Januarie 1989. Die FVPI Toekennening vir Dienste aan die Ingenieursprofessie deur Dr Nico Stutterheim toegeken — Deur A H L Fortmann, President bygewoon.
- Die Transvaalse Munisipale Vereniging Komiteevergadering op 25 Februarie 1989 in die Burgersentrum, Johannesburg gehou — Deur mnr Attie v d Berg, Elektrotegniese Stadsingenieur, Krugersdorp bygewoon.
- Die Goëie Hoop Tak van die VMEO se vergadering op 10 Maart 1989 te Kaapstad gehou — Deur A H L Fortmann, President bygewoon.
- Die Geassosieerde Wetenskaplike en Tegniese Verenigings van Suid-Afrika se Beheerdersvergadering gehou op 27 April 1989 in die SAIEE se Raadsaal, Kelvingebou, Johannesburg — Deur A H L Fortmann, President, bygewoon.
- Die Instituut van Munisipale Personeelpraktisyne se Konvensie, vanaf 10 tot 12 Mei 1989 te Durban gehou — Sou deur mnr F L U Daniel, Aangewese-President, bygewoon wees, maar ongelukkig het omstandighede hom verhoed om dit by te woon.
- Die Instituut van Munisipale Ingenieurs van Suidelike Afrika se 12de twee-jaarlikse Tegniese Vergadering, gehou in Kempton Park vanaf 17 tot 19 Mei 1989 — Deur A H L Fortmann, President, bygewoon.
- Toekennening van R250 prys vir beste vakleerling by die opleidingsentrum in Pretoria, mnr Steven Dave Naude op 24 Mei 1989 — Deur A H L Fortmann, President, bygewoon.
- Diplomaplegtigheid van die Technikon RSA, in die Linder Auditorium van die Johannesburg College of Education op Saterdag 3 Junie 1989 — Deur A H L Fortmann, President, bygewoon.
- Funksie van Vaardighede SA Nasionale Kompetisie oor Huis en Industriële Bedrading, om 'n afdelingwenner te kies om in Augustus 1989 na Engeland te gaan, gehou by die Eskom Opleidingsentrum, te Halfweghuis, op 7 Junie 1989 — Deur mnr Jules von Ahlfen bygewoon.
- Die Instituut van Stadsklerke van Suidelike Afrika: 30ste Kongres gehou in Kempton Park vanaf 5 tot 8 Junie 1989 — Deur A H L Fortmann, President, bygewoon.
- Toekennening van R250 vir die beste vakleerling by die opleidingsentrum in Durban op 9 Junie 1989 — deur F L U Daniel, Aangewese President, bygewoon.
- Die Transvaal Munisipale Vereniging Komiteevergadering op 24 Junie 1989 in die Raad se vergadersaal, Pretoria gehou — Deur mnr Coen Scherman, Elektrotegniese Stadsingenieur, Pretoria bygewoon.
- Toekennening van R250 prys vir die beste vakleerling by die opleidingsentrum in Johannesburg op 30 Junie 1989 — Deur F L U Daniel, Aangewese President, bygewoon.
- Internasionale Elektrotegniese Kommissie (IEK) Algemene Vergadering van vanaf 3–15 Julie 1989 in Brighton, Verenigde Koninkryk: Deur A H L Fortmann, President en mnr Attie v d Berg, Elektrotegniese Stadsingenieur, Krugersdorp, bygewoon.
- Vergadering van Presidente van ledeverenigings van die GW & TV wat op Vrydag 15 September 1989 in die Innis Teleskoopgebou, Sterrewaggebou, 18A Gillstraat, Observatory, Johannesburg gehou was. Deur mnr J A Loubser, Elektrotegniese en Meganiese Stadsingenieur van Benoni, bygewoon.

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**UITNODIGING: 52e KONVENIE 1991  
RDL F KOTZE; PORT ELIZABETH**

Mnr die President, namens die Burgemeester en Stadsraad van Port Elizabeth wil ons u baie, baie hartlik uitnooi om u Konvensie oor twee jaar in Port Elizabeth te hou.

(Die vriendelike stad)

Mnr Fred Daniel: President — Baie dankie Rdl Kotze, die VMEO aanvaar u uitnodiging met dank.

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# ELECTION OF PRESIDENT ELECT VERKIESING VAN AANGEWSE PRESIDENT

## J D DAWSON: UITENHAGE

First, Mr Daniel, congratulations on your election to the highest office in the AMEU and best wishes for a successful term as President.

Mr President, members of the AMEU, it is some years since the Presidency of the AMEU has come to the Eastern Cape. The most recent was when Ken Robson, the City Electrical Engineer of East London, was president from 1977 to 1979 and prior to that it was twenty-two years ago that David Murray-Nobbs of Port Elizabeth was president from 1965 to 1967.

In my opinion it is now time that the City Electrical Engineer of Port Elizabeth should be considered for the presidency of the AMEU.

Mr Charles Adams of Port Elizabeth is well known to all of you but for the record the following information is relevant.

Mr Adams comes from a family with a long association with the AMEU and the older members will recall his father who was the Town Electrical Engineer of Somerset West and a regular attendee at conferences.

Charles was born in Oudstroom and matriculated from the Boys High School there in 1950. He then went to Cape Town University from which he graduated as an Electrical Engineer in 1955.

Charles Adams is also a Professional Engineer, a Chartered Engineer, Member of the Institution of Electrical Engineers (London), Member of the South African Institute of Electrical Engineers and Member of the South African Institute of Management.

In 1956 he accepted employment with Associated Electrical Industries in Manchester, England, where he stayed for two years. I am sure that he regarded this as one of the best moves he ever made, because this is where he met and married Audrey, his wife. He has a son who has picked a career in computers, and a daughter with an Honours Degree in Psychology.

Terug in Suid-Afrika het hy as Assistent Ingenieur vir Eskom te Simmerpan, Germiston gewerk. Vroeg in 1961 het hy sy munisipale loopbaan begin toe hy as Assistent Ingenieur by die Munisipaliteit van Germiston aangestel is. In Oktober 1963 was dit Germiston se verlies en Port Elizabeth se wins toe hy na die vriendelike Stad verhuis het om as Assistent Ingenieur by die Elektriesiteitsdepartement te werk. In 1964 is hy bevorder tot Verspreidings Ingenieur, in 1968 tot Senior Ingenieur, in 1970 tot Hoof Ingenieur, in 1971 tot Adjunk Elektrotegniese Stadsingenieur en in Desember 1974 tot sy huidige pos as Elektrotegniese Stadsingenieur.

Dit beteken dat Charles Adams 'n deeglike eerstehande kennis van elke fase van 'n munisipale elektrisiteitsonderneming het, nog 'n rede waarom hy 'n uiters gesogte keuse vir aangewese president van die VMEO is.

Mr Adams has been a regular attendee at AMEU conferences and meetings ever since he became City Electrical Engineer of Port Elizabeth and almost invariably has been accompanied by his wife Audrey who I am sure will support him fully both when he is President-elect and when he becomes President in 1991.

Mr President, members of the AMEU it is my privilege as Town Electrical Engineer of Port Elizabeth's neighbouring town Uitenhage and as a member of the Cape Eastern Branch of the AMEU to formally propose Mr Charles Adams as President-elect of the AMEU for the period 1989 to 1991.

## MR F L U DANIEL: PRESIDENT

Ek vra nou Raadslid Kotze om vorentoe te kom om die voorstel te sekkondeer.

## RDL F KOTZE: PORT ELIZABETH

Mnr die nuutverkoose President, mnr die Burgemeester van Kaapstad, Ladies and Gentlemen, before I second this proposal I want to let you know that Mr Charles Adams is the gentleman known in Port Elizabeth as an engineer with a clean desk and I want to tell you that that's not so easily done. Dit is alleenlik 'n ingenieur wat sy personeel, sy manne onder hom, kan hou waar hy hulle wil hê. Vir my, as 'n Raadslid, is dit 'n baie groot eer om met so 'n "gentleman" saam te werk vir die afgelope twintig jaar sedert 1968.

Mr President, allow me please while I've got the opportunity on the rostrum as a believer, and I know you are too, Sir, may God bless you for the next two years. Secondly, Mr President, allow me to use the honeybrush and that is to the Past President. Mnr die uittredeende President, baie dankie vir u leiding as lid van die Uitvoerende Raad gedurende u termyn. U weet, toe daardie pragtige dorp van u in die nuus was, was ek in die eerste instansie iters bekommerd om hierdie Uitvoerende Raadsvergaderings in u gebied te woon, maar dit het wel andersins geblyk dat ons nog altyd welkom was.

Mr Past President, thank you very much indeed.

Secondly, I want to thank you for the hand of friendship that you have actually extended to the other engineers in the Republic of South Africa. Gentlemen, we cannot allow, at least that bridges are not being built between engineers in the Republic of South Africa. There are so many streams in the lovely country of ours to be bridged but this had me intensely worried that engineers in South Africa had followed their own path in the past. Baie dankie, mnr die voormalige President, dat u hierdie hand uitgestrek het na die siviele ingenieurs en dat daar 'n pragtige samewerking is in verband met hierdie instansie.

And thirdly, gentlemen, you know, one of the first jobs of the Good Lord was, let there be light. Ek sien altyd die elektrotegniese ingenieur in daardie lig wat as ons die lig nie het nie, wat daardie elektrotegniese ingenieurs daar kan stel nie, kan ons nie in die lig wandel nie en ons het tog 'n plig op aarde. And with those words, Mr President, it is a great pleasure for me to tell you that we would like and we will welcome Mr Charles Adams as the new President elect van hierdie pragtige Vereniging van u. Mag u lank lewe. Baie dankie.



Rdl F Kotze, Port Elizabeth

**MNR F L U DANIEL: PRESIDENT**

Is daar enige ander nominasies?

Geen verdere nominasies meer nie, dan verklaar ek dat mnr Charles Adams as Aangewese-President verkies is. Mnr Adams, kom nou vorentoe asseblief. Charles, congratulations.

**MR CHARLES ADAMS: PORT ELIZABETH**

Mr President, Mr Mayor, Ladies and Gentlemen, if there's one thing I hate in life it's speaking into a mike. It always makes me nervous especially on an occasion like this when I have been chosen to follow Fred as President in the AMEU. It is a very formidable task but one that I hope that I will fulfill as you would like me to. The AMEU is going to face many challenges over the next couple of years as the theme of the conference indicates and I only hope that I will make the AMEU into the sort of organisation that you would like to see.

Baie dankie vir die vertroue wat u in my gestel het. Ek is oortuig dat my Raad my ten volle sal ondersteun gedurende die tyd van my bestuur en ek hoop net dat ek u vertroue sal handhaaf. Dankie.

**MR F L U DANIEL: PRESIDENT**

Charles, thank you for your kind words and I am sure where your desk was clear at office, that is going to be a thing of the past. I'm the person who's going to have a clear desk from now on.



*The President, Fred Daniel, Cape Town, congratulates the newly elected President Elect, Charles Adams, Port Elizabeth.*

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**HONORARY MEMBERSHIP — ERELIDMAATSKAP**

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**MR F L U DANIEL: PRESIDENT**

Dames en here, ons kom nou by die toekenning van erelidmaatskap. Conferment of honorary membership. This is a very important item on our agenda, namely this conferment of honorary membership of the AMEU on four very distinguished persons who have been associated and rendered invaluable service to the AMEU over many, many years. This honour is not lightly bestowed therefore and I'm sure that you all agree is well deserved by those who will be receiving it here today.

**MR M P P CLARKE: RANDBURG****MR T HUGO: SANDTON**

Mr President, distinguished guests, Ladies and Gentlemen, it is my honour and privilege to have been invited to propose the conferment of Honorary Membership of the AMEU on one of

our very distinguished members. The conferment of Honorary Membership of our Association is a recognition of truly outstanding service to the Association and an acknowledgement of an engineer's competence by his peers.

Mr President, I wish to propose for that great honour, Mr M P P (Max) Clarke, Town Engineer of Randburg — my friend, counsellor and municipal neighbour.

Max was born, raised and educated in Butterworth, Transkei. After matriculating he enrolled as a student at the University of the Witwatersrand from where he graduated with a degree in Electrical Engineering in 1947. As a young engineer he returned to his much loved Eastern Cape and spent the next three years in East London, Kingwilliamstown and Alice where he was employed by Eskom, first as a Pupil and later as a Junior Engineer.

In 1951 Max set sail for wider horizons and spent two years



*Messrs Gordon Davies, Pietermaritzburg, Piet Botes, Roodepoort, Jan Loubser, Benoni and Max Clarke, Randburg, received Honorary Membership of the AMEU.*

with the B.T.H. Co. in Rugby, England, where he completed a Graduate Apprenticeship and, more importantly, met his future wife. He returned to Eskom as Test Engineer at Simmerpan, Germiston where, during the ensuing two years, he obtained his Government Certificate of Competency (Works).

It was in 1954 that Max made, what for him and, might I say, for the AMEU were to become significant decisions. In March of that year he married his lovely and charming wife, Eileen, and in June he joined the Municipal work as Town Electrical Engineer of Somerset East. The Clarks lived in Somerset East for 16½ happy years where Max built overhead lines, in colloquial terms, "for Africa".

In 1970 Max was appointed Town Electrical Engineer in Newcastle, Natal, where he spent what, during that period, must have been a very hectic 6½ years. In 1976 he moved to Pietermaritzburg where he spent 3 years as Assistant Town Electrical Engineer.

In January 1979, much to my delight, Max was appointed as the first Town Electrical Engineer of Randburg. I remember visiting Max shortly after his appointment in Randburg. He was the Electricity Department and had established himself in a house which had been expropriated or purchased to make way for new Civic buildings. Max's office was the main bedroom. Today the Department has a staff of about 150.

Max has always been a most active member of the AMEU. He became an Engineer Member in 1955 and attended his first convention in Margate shortly thereafter. He served two terms as Chairman of the Cape Eastern Branch and it was during one of those terms of office in the late sixties that I first met Max. He kindly invited me (a commercial at the time) to present a short talk on aluminium in Somerset East to what was obviously a very active branch of the AMEU. I was as nervous as a kitten, but Max, all of seven years my senior, looked after me like a father. A most memorable visit!

Max served two terms as Chairman of the Natal Branch and one as Chairman of the Highveld Branch. He was appointed to the AMEU Executive Committee in 1983 and has been Convenor of the Publicity Committee ever since. Since January 1986 he has been Chairman of the Recommendations Committee and is the AMEU representative on the S.A. National Committee of the World Energy Conference — he returned only last week from a conference which was held in Montreal, Canada.

Besides his municipal, and AMEU interests and activities which would be enough for most mortals, Max found the time to be Chairman of the Natal Inland Regional Committee and the Johannesburg Regional Advisory Committee of NOSA of which Committee he is presently a serving member. He is a member of his Church Council and Finance Committee.

He played bowls regularly until some years ago but now finds time for only the occasional game.

This next item could have been included under either the heading "AMEU" or "Hobbies". — I decided upon the latter. Max, in all the spare time at his disposal started, compiles and edits our most excellently produced, glossy magazine, AMEU News. If anyone was wondering why they never see photos of the Town Electrical Engineer of Randburg in that magazine — well, the answer is simple, he is either on the wrong side of the camera or in the dark room.

Max and Eileen have three lovely married daughters and three grandchildren.

Mr President, Ladies and Gentlemen, it is a great privilege to be a member of the AMEU but in this particular instance one can reverse that statement and say that the AMEU is the privileged one for having had Max as a Member. It is with honour and much pleasure that I formally propose that Honorary Membership of the Association of Municipal Electricity Undertakings be conferred on Mr Max Percival Preston Clarke.

## MNR P J BOTES: ROODEPOORT

### MNR A H L FORTMANN: BOKSBURG

Meneer die President, dames en here. Ereliedmaatskap word nie ligtelik aan iemand deur die VME0 toegeken nie. Die Uitvoerende Raad besin diep en ernstig voordat 'n aanbeveling vir so 'n toekening gemaak word.

Een so 'n persoon waaroor die Uitvoerende Raad besin het is mnr Piet Botes, Elektrotegniese en Meganiese Stadsingenieur van Roodepoort.

Mnr Pieter Johannes Botes is op 30 Mei 1929 in die Vrystaat gebore waar hy op die plaas Suringbank, naby Ascent, groot geword het. Hy het sy hoërskoolopleiding aan Vrede Hoërskool ondergaan en sy universitêre opleiding aan die Universiteit van Stellenbosch vanaf 1947 tot 1951, waar hy sy graad B.Sc Elektroties (Swaarstroom) verwerf het.

Hy is met Urtney getroud en uit die huwelik is vier kinders gebore: twee seuns en twee dogters. Sy stokperdjies is ver wyder van elektrotegniese ingenieurswese, naamlik hengel en wildevoëlboerdery.

Hy is in besit van die Sertifikaat van Bevoegdheid vir Elektrotegniese Ingenieurs asook die Sertifikaat van bevoegdheid vir Meganiese Ingenieurs. In September 1969 word hy as Professionele Ingenieur geregistreer en is 'n Genoot van die Suid-Afrikaanse Instituut van Elektrotegniese Ingenieurs. Verder het hy ook die Diploma Organisasie en Metodes in April 1974 verwerf en is 'n Genoot van die Ingenieursgenootskap van Suid-Afrika.

Piet het sy diensloopbaan as Leerling-Ingenieur by ESKOM in 1952 begin waarna hy in ESKOM se Verspreidingsinstandhoudingsafdeling tot 1955 werksaam was.

Vir ongeveer een jaar was hy Tegnieis Ingenieur by die Johannesburgse Elektrisiteitsdepartement.

In Oktober 1956 word Piet as Assistent Stadslektrotegniese Ingenieur by die Stadsraad van Roodepoort aangestel. Hier word hy in Augustus 1961 bevorder tot Stadslektrotgniese Ingenieur nadat mnr Derek Brown Roodepoort se diens verlaat het en Stadslektrotegniese en Meganiese Ingenieur in 1969.

Ek ken Piet reeds sedert 1961. In 1961 het ek vir ongeveer vier jaar onder hom as Verspreidingsingenieur by die Stadsraad gewerk. Hier het ons vanselfsprekend nou kennis gemaak en het ek baie van munisipale ingenieurswese by Piet geleer.

Mnr Botes loop al 'n lang pad met die VME0. Nadat hy Stadslektrotegniese Ingenieur van Roodepoort geword het, het Piet uit die staanspoor in die VME0 na vore getree en reeds in 1966/67 word hy sekretaris en in 1972/73 voorsitter van die Hoëveldtak.

As early as 1971 Piet was elected onto the AMEU Executive Council. In February 1979 he was inducted for a two-year term, as President of the AMEU at the Convention held at the Rand Afrikaans University.

To date Piet has served the AMEU on the Executive Council faithfully for some eighteen years.

As Chairman of the Electricity Supply Committee, Piet has done sterling work, as I also pointed out in my Presidential Address.

On the 24th of May 1985 Mr Botes was appointed onto the Electricity Council of Eskom by the Minister of Mineral and Energy Affairs, for a period of three years. In May 1988 this appointment was extended for a further two-year period by the Minister of Administration and Privatisation.

Piet's deep knowledge and experience has helped him to make extremely valuable contributions to the working of the Electricity Council. He also serves on three Committees of the Electricity Council, namely the Finance Committee, the Tender Committee and the Tariff Committee.

Mr President, Ladies and Gentlemen, I am sure you must agree with me that Mr Piet Botes has all the attributes required of someone who deserves the conferment of Honorary Membership.

Dit is dus met groot genoeë en my voorreg dat ek die voorstel

aan hierdie konvensie voorlê dat ereldmaatskap van die VME0 aan Petrus Johannes Botes toegeken word.

Dankie mnr die President.

#### **MNR P J BOTES: ROODEPOORT**

Dankie dat u my kies as Erelid. Ek wil nie veel sê nie, net 'n paar bedankings doen. Dit is vir my 'n baie groot behoefte van die hart om 'n paar bedankings te doen wanneer mens so 'n groot eer ontvang het en jy weet dat daar ander mense agter jou is wat jou gehelp het om dit te kon doen. Eerstens wil ek net graag vir mnr Alwin Fortmann bedank vir die mooi woorde wat hy my toegedig het. Ek is bly hy het nie 'n paar ander gesê wat nou nie so baie mooi vleien is nie. Dan wil ek graag vir die Stadsraad van Roodepoort bedank dat hulle dit vir my moontlik gemaak het om al die werk te kon doen en die rondryery en die afwesigheid van die kantoor af — ook vir die gebruik van die hulpmiddels om my werk te kon doen wat ek vir die VME0 onderneem het. Ek wil dan ook graag my sekretaresse, mev Legounie bedank vir al die jare vir wat sy gedoen het vir die reëlens en al die tiewerk wat sy gedoen het maar laastens maar nie die minste nie wil ek graag my vrou Urtney bedank vir haar hulp en bystand. Baie dankie dames en here.

#### **MR E G DAVIES: PIETERMARITZBURG**

##### **Mr A H FRASER: HONORARY MEMBER**

Mr President, distinguished guests, ladies and gentlemen.

It has been my privilege to have been associated with Gordon Davies for some 40 years in the common pursuit of careers in electrical engineering. After that length of time I should be able to say I really know him. But I hesitate to do that as Gordon is a man of many parts and only this week did he reveal to me some snippets from his earlier days, before I met him, to which I shall refer later.

However, what I do know of his character and achievements leaves me in no doubt that he is worthy of the highest recognition which the AMEU can confer.

Gordon was born in Swansea, Wales and came to South Africa at the age of 6. He was duly enrolled at King Edward Preparatory School where he made an immediate impact. This is what I didn't know before and as it is contained in his published Curriculum Vitae I am sure he won't mind my revealing it to you. At the end of term he succeeded in coming 39th out of 40 — the last student was mentally deficient. The headmaster's comments on his report were hardly comforting to any parent — "Very weak indeed. More concentrated effort needed" and it is a tribute to Gordon's honesty and integrity that this glowing report not only arrived home safely but has been preserved for us to this day.

Many illustrious worldly figures failed to reveal their potential at school — Winston Churchill for example — and the fact that Gordon's best subject according to that school report was science or nature study, where he was rated "Fairly Good" gave a pointer to his latent abilities and future successes.

After a brief return to the UK at the end of his preparatory schooling, Gordon studied at the Glenwood High School in Durban followed by a period of part time study at the Natal Technical College (now the Technikon) — this qualified him for membership of the IEE, London and today as a Fellow of this Institution he represents this body in Natal.

My first introduction to Gordon was during his seven years service with the Electricity Department of the Durban City Council as an Assistant Engineer from 1947 to 1954 before he underwent a two year Graduate Works training at G.E.C. Winton, Birmingham. This valuable training, which regrettably is not readily available to South African Graduates any more, equipped him to take responsibility for commissioning tests on 5 x 30 MW alternators for Johannesburg City Council. He must have checked them well as they are still going strong. In addition he was responsible for tests on other installations of H.V. switchgear, pumps, etc. for G.E.C. South Africa from 1957 to 1961.

This very sound training and experience ensured that Gordon would climb the ladder of success when he returned to the municipal service in 1961 as Assistant/Deputy City Electrical Engineer of Pietermaritzburg and since taking over from Jack Waddy as head of that Department in 1978 he has filled the post with distinction. It can be said of Gordon Davies that he made the grade the hard way, improving his qualifications by part time study at Technical College and University and he must be admired for his determination and perseverance especially after a somewhat discouraging start at prep school. Would his Headmaster have believed that the pupil he rated "very weak indeed" would rise to be City Electrical Engineer of the capital city of Natal and be able to string a mass of letters behind his name including Pr.Eng., C.Eng., MSc, F.I.E.E., etc. in addition to passing the final examination of the Institute of Chartered Secretaries and Administrators?

Apart from his interest in technical matters Gordon is a "peoples' person" having served as President of his Rotary Club in Pietermaritzburg East. He plays tennis and bowls well and latterly golf — perhaps he had better tell you how well! I think, though that his greatest interest is the "Remuneration of Town Clerks Act"!

Time does not permit my listing many other achievements of which Gordon could justifiably boast. The AMEU has had the benefit of his ability and support for more than a decade including service on the Executive Council and the Technical Training and Electricity Supply Committees. They will soon have to somehow manage without him when he joins the elite ranks of the pensioners.

Mr President there can be no doubt that Mr Edward Gordon Davies is in every respect deserving of election to Honorary Member of the AMEU and I have much pleasure in proposing accordingly.

#### **MNR J A LOUBSER: BENONI**

##### **MNR J K VON ALHFTEN: ERELID**

Meneer die President, dames en here dit is nou presies 30 jaar gelede dat ek my eerste konvensie van die VME0 in Johannesburg bygewoon het en in hierdie tydperk het ek baie ere-ede sien kom en gaan. Elkeen van hierdie ere-ede het hierdie besondere erkenning terdê verdien in 'n besondere bydrae hetsy in die VME0 of die elektrisiteitsvoorsiening bedryf in sy geheel.

Dit was ook my voorreg om in hierdie tydperk 'n hele paar lede van die VME0 vir ereldmaatskap aan die konvensie voor te stel en vandag is dit weer my voorreg om so 'n voorstel aan die konvensie voor te lê.

As daar een persoon was wat hom gedurende sy ampstermyn beywer het om wyer erkenning van die VME0 te verkry dan is dit Jan Louber voormalige President vir die jare 1985 en 1986. Dit is dan ook aan sy toedoen te danke dat die VME0 vandag veel wyer erkenning geniet as wat dit die geval in die verlede was en hy beywer hom nog steeds daarvoor, waarvoor ons hom besondere dank verskuldig is.

Ek het die eerste keer kennis gemaak met Jannie toe hy die Elektrotegniese Stadsingenieur van Carletonville was en hom baie beter leer ken toe hy die Elektrotegniese Stadsingenieur van Benoni geword het in 1970, as my buurman in Springs. Dit was dan ook nie lank hierna nie dat hy op die Uitvoerende Raad van die VME0 in 1975 verkies is en vinnig opgang gemaak het tot met sy verkiesing as President in 1985. U hoef maar net na die verslae te kyk om te sien watter waardevolle bydrae hy maak. Jannie is 'n produk van die Universiteit van Stellenbosch met 'n B.Sc. Ing.(Elek) wat hy in 1954 verwerf het. Hy is dan ook die vierde oud-matie wat die President van die VME0 geword het na myself, Eugene Pretorius en Piet Botes. Hy is 'n Vrystater van geboorte en skoolopleiding waar hy in Parys sy matriek geslaag het — hy was dan seker ook bly dat die Vrystater onlangs die WP oer aangest het op Nuweland, alhoewel ons as oud-maties duim vashou dat die WP Saterdag die Curriebeker van die Blou Bulle gaan terugvat.

Jannie is getrou met Martie en hulle het 4 seuns waarvan 2 reeds getroud is — en glo dit as u wil by is reeds drie keer oupa

— ek moet sê hy begin dit al lyk in vergelyking met myself wat nog te jonk getroud is om 'n oupa te wees!

Meneer die President, dames en here u sal dus met my saamstem dat as daar een persoon is wat voldoen aan die vereistes vir erelid van die VMEQ dan is dit Jannie Loubser en dit is dus

dan met groot genoegdoening dat ek die voorstel vandag hier indien dat erelidmaatskap van die VMEQ aan Johannes Abraham Loubser toegeken word.

Ek dank u.

## OPENING ADDRESS — OPENINGSREDE

### RSA ENERGIEBELEID: ELEKTRISITEIT 'N DISTRIBUSIE EN BEMARKINGSTRATEGIE

DR DIRK C. NEETHLING  
UITVOERENDE HOOF: NASIONALE ENERGIERAAD

#### CURRICULUM VITAE: DR DIRK C NEETHLING

Dirk Neethling is Chief Executive of the National Energy Council which was established in late 1987 to guide, promote and co-ordinate the energy interests of the country in partnership with the private and public sectors.

As former Deputy Director-General, Chief Director of Energy, of the Department of Mineral and Energy Affairs, Head of the Minerals Bureau and as the Minerals Counsellor at the South African Embassy in London, together with many years as Exploration Geologist in Southern Africa and the Antarctic, he has acquired a wide experience in national and international energy and minerals related affairs.

He is presently Chairman of the Electricity Control Board and Serves on the Councils of Directors of the Central Energy Fund, Mossfass, Soekor, Sasol III, The Electricity Council and the Transport Advisory Council. Dirk is a graduate of the universities of Stellenbosch, Pretoria and Natal.

Mnr die President, die edelbare burgemeester van Kaapstad, ander hoogwaardigheidsbekleërs, dames en here.

Dit is vir my 'n besondere voorreg om die 51e konvensie van die Vereniging van Munisipale Elektrisiteitsondernemings hier in die Moederstad te open.

Before I start, I would like to compliment Messrs Alwin Fortman, the President, on a job well done, to wish the President-elect, Fred David, everything of the best, congratulations to the incoming President, Mr Adams and to all others who have been honoured today. Welcome to past presidents with sincere greetings to those I know personally — on behalf of the National Energy Council and the Electricity Control Board.

Ek wil die opening van die Konvensie aan die hand van 'n referaat doen wat teen 'n agtergrond van die RSA se energietoestand die rol van die Nasionale Energieraad in oorhoofse energiebeleidsformulering en -implementering skets, ek wil dit doen met besondere verwysing na die beskikbaarstelling van elektrisiteit deur Eskom in besonder en die beleid en visie wat daarmee gepaard gaan. Ek wil aantoon wie die rolspelers in beleidsformulering is en in besonder wys op die sentrale rol wat die verbruiker in alles speel. As sentrale tema wil ek dui op die kardinale belang daarvan om elektrisiteit te bemark, nie net om dit te verkoop nie, maar inderdaad te bemark ten einde te verseker dat die verbruiker elektrisiteit nie net in toepaslike en bekostigbare vorm bekom nie maar dit op die meer effektiewe en doeltreffende wyse gebruik. Deurlopend wil ek vir u oortuig dat die VMEQ 'n sleutelrol het om te speel in die ontplooiing en formulering van elektrisiteitsbeleid veral ten opsigte van die implementering van 'n distribusie- en bemarkingsstrategie, beide in stedelike sowel as landelike omgewing, in eerste- sowel as in derdewêreld verband.

Kom ons begin deur ons net weer te herinner aan wat ons land se huidige en voorsiene energietoestand is.

Die Republiek van Suid-Afrika is, behalwe tans vir natuurlike olie, mildelik gesien met omvangryke energiebronne. Steenkool is op hierdie oomblik verreweg die belangrikste fossielbrandstof benewens uraan wat mettertyd sy regmatige plek sal moet inneem. Binne die volgende dekade, glo ek, sal natuurlike gas wat in 'n aflandige omgewing reeds ontdek is 'n steeds toenemende rol speel in die ontwikkeling van energiebronne in Suid- en Suider-Afrika konteks.

Die grootskaalse verbranding van fossiel- of nie-hernubare energiebronne in besonder van steenkool vir elektrisiteitsopwekking, vorm die hoeksteen van die Suid-Afrikaanse energie-ekonomie, terwyl die omsetting van steenkool asook die van natuurlike gas na sintetiese vloeibare brandstowwe die RSA se afhanklikheid van ingevoerde ru-olie, gesien teen die agtergrond van 'n olie-boikot, wesenlik temper. Suid-Afrika is dus aangewese op sy steenkoolbronne vir sy bestaande en voorsiene energiebehoeftes. Die RSA het dus in dié opsig 'n mono- of nie-gediversifiseerde ekonomie. Wat die gebruik van hernubare energie betref, is dit gereken op 'n totale energiebasis heelwat minder as die van steenkool. Dit vorm egter verreweg die belangrikste bron van energie vir ons ontwikkelende gemeenskappe hoofsaaklik in die vorm van brandhout biomassa en afvalprodukte waar nie net groot tekorte voorkom nie, maar omvangryke nadelige omgewingsimpakte as gevolg van grootskaalse ontbossing aan die orde van die dag is.



Dr D C Neethling

Suid-Afrika sal, soos in die verlede, groot uitdagings die hoof moet bied om toekomstige energiebehoefes te bevredig. 'n Sleutelveranderlike in terme van toekomstige energievraag is wat die werklike prestasie van ons ekonomie in die toekoms gaan wees. Faktore soos politieke stabiliteit, ontwikkeling of stagnasie; buitelandse beleggingsvertroue of sanksies; is vanselfsprekend van kardinale belang. Die doel van energiebeleid bly na dit alles om ener syds die bestendige, die toereikende en die toepaslike voorsiening van energie teen markverwante pryse na te strew, en andersyds, die bevordering van die doeltreffende benutting van energie, in al sy vorme te bevorder. Energie dring deur, inderdaad energie is part en deel, van ons bestaan en van ons ekonomiese welvaart, dit beïnvloed die kwaliteit van lewe, dit raak ons voortbestaan direk, nie net die voortbestaan van ons in die Republiek van Suid-Afrika in besonder nie, maar ook van almal in al die lande van Suider-Afrika.

Om terug te keer na steenkool, en elektrisiteitsopwekking in besonder, wil ek graag 'n paar pertinente syfers onder u aandag bring net om te illustreer hoe lyk die toekoms wat ons tegemoet gaan.

Tans word amper die helfte (65 miljoen ton) van die RSA se totale lokale verkoopbare steenkoolproduksie aangewend om elektrisiteit op te wek. Oor 10 jaar, teen die jaar 2000, is die verwagting dat bykans 60% of meer as 100 miljoen ton daarvan vir elektrisiteitsopwekking verbrand sal word. Dit is baie steenkool gemeet teen enige standaard en, alhoewel die RSA se steenkoolbronne omvangryk is, is dit ongelukkig van 'n lae graad. Die omvang daarvan word tans op 121 biljoen ton *in situ* beraam waarvan sowat 46 persent of naasteby 55 biljoen ton winbaar is. Dus is minder as die helfte van die RSA se steenkoolbronne tans ekonomies ontginbaar. Dit is dus van wesenlike belang dat mynboumetodes so doeltreffend moontlik is en dat die afval of uitkotssteenkool tot 'n minimum beperk word. Maar wat vind ons? Jaarliks word tot soveel as 20 persent van steenkoolproduksie of 46 miljoen ton van Suid-Afrikaanse steenkoolproduksie op die oppervlakte gestort.

As dit so aangaan, en selfs sou daar aanvaar word dat sowat 'n derde van die totale uitkotskonnemaat onbenutbaar is omdat die hittewaarde te laag is, dan word daar nogtans verwag dat, voor die einde van hierdie eeu net tien jaar van nou af, net soveel potensieel benutbare uitkotssteenkool per jaar gestort sal word as wat tans in die RSA vir elektrisiteitsopwekking verbrand word — om nie eens te praat van die meer as 'n biljoen ton wat nie net teen daardie tyd onbenut op die grond sal lê nie, maar daarbenevens 'n hoë en inherente besoedelingsimpak sal hê. Dit dui op die noodsaaklikheid dat nuwe myn- en

benuttingstegnologieë ontwikkel en implementeer moet word om die steeds toenemende lae graadse steenkoolbronne van ons land meer doeltreffend te kan benut en die uitkots wat gestort word as energiebron aan te wend en terselfdertyd die daarmee gepaardgaande omgewingsimpak te verminder. Die Nasionale Energieraad en die steenkoolbedryf is aktief besig met 'n uitgebreide program om hierdie probleem aan te spreek. Later sal ek ook vir u aandui hoe 'n belangrike rol Eskom speel in die benutting van ons lae graadse steenkoolbronne in die opwekking van elektrisiteit.

As far as nuclear power is concerned, it is well known that South Africa is not only a major supplier of uranium to the Western World but that adequate uranium resources exist to fuel a domestic nuclear power programme for the foreseeable future. South Africa's first and only nuclear power station Koeberg, a 1 840 MW reactor, was commissioned by Eskom during 1984. In order to determine South Africa's future nuclear power requirements, a joint study was recently undertaken by the Atomic Energy Corporation and Eskom to determine future electricity generation needs. The findings indicate that it would be necessary to commence phasing in nuclear power stations from the year 2000 as a back-up to coal-fired stations. This proposed programme allocates to nuclear power an estimated 10% contribution to total electricity generation up to approximately the year 2025. After this it would appear that no further coal-fired power stations would be constructed as a result of declining extractable coal reserves and that nuclear power will be increasingly utilized as one of the more important proven alternatives — the point being that nuclear energy would be introduced on a gradual and complementary basis to coal-fired electricity, and not in big blocks or in lieu thereof. No doubt by that time offshore gas in South and Southern Africa and the so-called Pan African electricity network could play significant roles to augment electricity supply. According to John Maree, Chairman of Eskom and the Atomic Energy Corporation as well as a member of the National Energy Council too, Eskom is already busy identifying sites where nuclear stations can be built.

As far as renewable energy is concerned, as was briefly mentioned before, it is appropriate to provide a generalized overview of the prevailing situation before proceeding further. The more important renewable technologies as far as application in the Southern African context is concerned may be grouped according to end-use namely, urban energy systems which include application in the metropolitan urban and peri-urban areas, and rural energy systems which firstly encompass the farming areas (first and third world) and secondly the more underdeveloped areas comprising of villages and settlements.



*A sight on the large attendance of delegates*

As far as the ranking of the various renewable energies according to appropriateness of use is concerned this would obviously differ from location to location depending on type of demand (e.g. household or village) and proximity of on-grid electricity supply. For the RSA the more appropriate renewable energy options for the near and medium term that is up to the year 2000, appear to be:

- Urban Energy Systems ● Passive solar energy  
● Thermal solar energy  
● Municipal refuse
- Rural Energy Systems ● Passive and thermal solar energy  
● Photovoltaic (solar energy)  
● Desalination (solar energy)  
● Biomass (including fuelwood)  
● Wastes (biomass and animal)  
● Small scale hydro-electric schemes  
● Wind (local application)

It is apparent that the supply of electrical energy based on the present costs of on-grid coal-based electricity supply in many parts of the Southern African Region, particularly in the RSA, rules out, for the present and no doubt for the immediate future too, significant alternative renewable electricity supply options particularly in the metropolitan, urban and peri-urban environments. Here solar energy as a complementary source of thermal energy for water heating and passive solar energy utilised in the design and placement of buildings, seem to be the only possible cost effective options.

As far as off-grid supply of electricity by renewables is concerned though, particularly utilising stand-alone systems in remote farming areas and as well as within developing communities located in distant villages and settlements, the use of alternative energy is far more promising and the application of photovoltaic solar energy for the supply of electricity and the use of solar energy for the supply of hot water, are already regarded as the more cost effective off-grid options in many instances.

The National Energy Council (NEC) has accorded a high priority to the investigation of the viability of stand-alone power systems based on renewable energy in remote areas. This is being done in association with all interested parties in the public and private sectors.

The NEC has also, as far as the needs of developing communities in particular are concerned, established a Centre of Expertise on Appropriate Energy in Cape Town in collaboration with the Energy Research Institute and the University. The Development Bank of SA, Eskom, and the private sector are closely involved in this programme and, hopefully in time the various local governments too. Indeed a policy area which the AMEU should not only promote, but become actively involved.

Teen hierdie breë agtergrond en met dit as vertekpunt wil ek graag die ontloopting van energiebeleid, met spesifieke verwysings na die totstandkoming van die Nasionale Energieraad, in besonder verder met u bespreek.

Ek wil begin deur daarop te wys dat na aanleiding van die groot-skaalse en wêreldwye ontgraving tydens en na afloop van die twee energiekrisisse van die vroeë en laat sewentigerjare, dit deurlopend nodig is om die RSA se energiestrategie in hersiening te neem ten einde dit optimaal te rig. Sodanige beleidsformulering kan vanselfsprekend nie in isolasie geskied nie, want die RSA vorm immers part en deel nie net van die wêreld-energiesituasie in die algemeen nie, maar van Suider-Afrika in die besonder. Daarbenewens bly die RSA tans nog onderhewig aan internasionale politieke druk en in energieverband, aan 'n olie-boikot.

Die formulering en implementering van 'n oorhoofse energiestrategie vir die land is uiters 'n komplekse en deurlopende taak wat raakvallig het met bykans elke aspek van lands- en verbruikersbelang op nasionale, streek en op plaaslike vlak. Dit impliseer die grootste mate van vryheid met betrekking tot die werking van markkragte, betrokkenheid van die private sektor by die formulering en implementering van beleid en strategieë en 'n soepel dinamiese milieu om tred te hou met die immer

eranderende energiesituasie en -prioriteite. Dit hou direk verband met toekomstige beleidsprioriteite ten opsigte van landsbeleid soos devolusie van mag na plaaslike vlak, verstedeliking sowel as die ophewing van die lewenstandaard in agtergeblewe gebiede, en is van kritiese belang in die privatisering van sentrale en plaaslike owerhede veral met betrekking tot die voorsiening van energie, in besonder elektrisiteit. Op nasionale vlak hou die toereikende en deurlopende voorsiening van energie direk verband met die behoud van nasionale veiligheid.

Dit is wat aanleiding gegee het tot die ter aflegging van die Witskrif oor Energiebeleid van die RSA wat in 1986 gepubliseer is en die Wet op Energie wat die jaar daarna gepromuleer is en waaruit die Nasionale Energieraad tot stand gekom het.

Die Witskrif omskryf 'n beleidsraamwerk waarbinne toepaslike energiestrategieë geformuleer behoort te word wat basies op die volgende riglyne neerkom:

- Besikbaarheid van voldoende en toepaslike energie aan almal binne ekonomies verantwoordbare parameters.
- Bevordering van energieoortreffendheid in produksie sowel as verbruik.
- Ontwikkeling van eie energiebronne en 'n gediversifiseerde energie-ekonomie.
- Geïntegreerde benutting van beskikbare hulpbronne.
- 'n Markegerigte energie-ekonomie met inagneming van strategiese energievoorsiening en die handhaving van 'n passieke en bestokbare vlakke van selfversorgendheid.
- Daarstelling van 'n gekoördineerde tegnologie energiestrategie en 'n nasionale energienavorsing-, ontwikkeling- en demonstrasiepoging, en
- Interstaatlike samewerking in die Suider-Afrikaanse verband.

Hierdie riglyne behoort 'n gestruktureerde en gekoördineerde benadering tot energiebeleidsformulering te vestig met toepaslike ondersteunende strategieë as meganismes vir toekomstige implementering.

Wie na alles is die vernaamste rolspelers in die formulering en implementering van energiebeleid? Soos u gehoor het is dit gerig op nasionale en verbruikersbelang. Ons almal is dus betrokke, die regering en die plaaslike owerhede, die privaat- en publieke sektore, die produsente, die energienyerwerd wat vandag in sulke groot getalle ook hier verteenwoordig is en die verbruikerssektore. Die rolspelers? Vir vandag se geleentheid sou ek sê dat wanneer dit by plaaslike owerhede kom dan het die Vereniging van Munisipale Elektriese Ondernemings 'n besondere rol om te speel wat ek aanstonds in meer besonderhede sou wou toelig. Die ander rolspelers, veral op oorhoofse vlak is die Nasionale Energieraad en die Elektrisiteitsbeheerraad, op sentrale vlak natuurlik Eskom en op plaaslike vlak die VMEQ, die Vereniging van Munisipale Bestuur en alle ander tersaaklike organisasies en instansies. Soos u weet is die VMEQ reeds amptelik verteenwoordig deur Piet Botes op die Elektrisiteitsraad en Wessel Barnard op die EBR; waar ook die Vereniging van Munisipale Bestuur, in die persoon van Zanus Immelman verteenwoordig het. Voordat ek verder gaan wil ek kortliks terugkeer na die Nasionale Energieraad wat die koördinerende faktor, tesame met die EBR, in elektrisiteitsbeleid sal word en meer oor die NER sê.

Die Nasionale Energieraad is, soos ek gesê het, kragtens die Wet op Energie teen die einde van 1987 in die lewe geroep. Hierdie gebeurtenis was inderdaad 'n mylpaal in die geskiedenis van energiebeleidsformulering en -implementering in die RSA. Dit lui nie net, 'n mens kan amper sê die privatisering van die Staat se rol in die land se energiesake in nie, maar betrek ook die publieke en private sektore op die hoogste vlak by die beplanning, koördinerende en rig van oorhoofse energiebeleid sowel as by die implementering daarvan op alle vlakke van landregering en hopelik in die privaat- en bedryfsektore ook.

Die Raad van die NER is saamgestel uit lede vanuit sowel die privaat- as openbare sektor. Die Nasionale Energieraad is dus 'n privaat-/staatssektorinstelling wat die Minister van Minerale- en Energiesake op 'n pro-aktiewe en beleidsgerigte wys adviseer. Die missie van die NER, om die energiebelange van die RSA te rig, te bevorder en te koördineer in samewerking met die openbare en private sektor, reflekteer inderdaad hierdie basiese filosofie.

Die administrasie en implementering van die volgende energiewettewetgewing is ook deur die Minister van Mineral- en Energiesake aan die NER oorgedra, te wete:

- die Wet op Vloeiende Brandstof en Olie
- die Wet op die Sentrale Energiefondse
- die Wet op Petroleumprodukte
- die Wet op Steenkool
- die Wet op Steenkoolhulpbronne, en
- die Wet op Energie

Die NER verskaf ook die nodige vakkundige en sekretariële ondersteuning aan die Elektrisiteitsbeheerraad, wat as 'n afsonderlike en outonome Raad in terme van die Elektrisiteitswet, funksioneer. Eskom bedryf natuurlik sy eie wet, die Eskomwet, No. 40 van 1987. Die NER is ook betrokke by SATEKG (SA Telekommunikasie en Kragopekklings Gesag) saam met onder andere Eskom en die VME0.

Die Nasionale Energieraad verky sy fondse hoofsaaklik uit heffings op energiedraers, te wete op vloeiende brandstowwe, steenkool en elektrisiteit, terwyl parlementêre bewilligings tot 'n mindere mate sy fondse aanvul ter vergoeding vir spesifieke funksies wat deur die NER verrig word soos die administrasie van voorgenoemde wette en ten opsigte van interstaatlike skakeling in energieverband.

Die kernaktiwiteitsgebiede van die NER kan soos volg saamgevat word:

- elektriese energie (met inbegrip van kernenergie);
- vervoerenergie;
- energiebronne (fossiel, kern, sowel as hernubare);
- nuwe energietechnologie;
- energiebenutting (doeltreffendheid en konservering en omgewingsbewaring);
- toepaslike energie in ontwikkelende gemeenskappe;
- energiegebruikheidsbeplanning; en
- interstaatlike energiesamewerking in Suider-Afrika en internasionale verband.

Several committees have been appointed to advise the National Energy Council on priorities, action programmes, technology and research and development. These committees, which are presently being reconstituted, are policy and technology driven, so as to enable them to render appropriate advice regarding the activities and projects required in order to implement the various energy strategies. The chairmen and members are selected for their knowledge with regard to specific energy and related fields and come from the private and public sectors, the energy industry, universities and research institutions.

It is in this field that I see close co-operation with the AMEU particularly in the field of electrical energy. The AMEU has, as you are aware, already submitted electricity-related project proposals for research and development for the consideration of the NEC, for this we are grateful. I invite you to participate to an even greater extent particularly in areas of common interest in local electricity distribution, the marketing thereof and efficiency of use, indeed I invite you today to become full-time members of the National Energy Council's Advisory Committees on Electrical Energy and on Energy Efficiency.

The AMEU is also represented in the person of your past President Alwin Fortmann, on the NEC/Eskom's organizing committee for the arrangement of a seminar comprised of invited experts to draft an electricity strategy for the country at all levels, to be held in April next year. The proposed policy and strategies will be circulated for comment with a final draft strategy in place by mid-1991 for further consideration by the various energy-related councils and authorities at all levels of government.

Having made mention of Eskom so frequently it is incumbent on me to highlight its central, indeed critical, role in the electricity industry of South Africa. It is indeed my privilege to serve, along with Piet Botes as representative of the AMEU, on the Electricity Council of Eskom.

Eskom as you know supplies more than 97 percent of the electricity used in South Africa of which about I believe just more

than 60 percent is sold directly to mines, industry, commerce rural and domestic consumers and the railway system. The rest is supplied to municipalities and neighbouring countries which resell the electricity to end users in their areas.

It is well known that Eskom is a leader in power station and transmission technology. It operates some of the world's largest coal-fired power stations, runs the world's largest direct and indirect dry-cooled stations and is a recognised authority on the use of coal of an extremely low grade, possibly the lowest in the world used for power generation. It leads research into the effects of lightning on power supply systems. Eskom believes, in John Maree's words, that the biggest contribution that Eskom can make to South Africa's economy is to keep electricity costs down. Indeed a strategy well worth emulating by local government, and the AMEU. Eskom also believes that the only way to meet the challenges of electricity supply in South Africa is to run Eskom as a professionally managed business undertaking with the customer as the main focus Eskom indeed believes in and subscribes to the strategy of the marketing of electricity.

It is acknowledged in Eskom that top business undertakings are driven by managers and employees who have a common vision, common values and the energy to turn their vision into reality. Eskom has such a vision, indeed this is what I believe should be the vision of the AMEU too. Eskom aims to provide an excellent product and service to its customers, make electricity available to all the people in South Africa, support the development of neighbouring states by the development of a regional network, a field in which Ian McRae, Eskom's chief executive, is playing a leading role. All achievable aims by local governments with the AMEA as the leading light.

It is a known fact that the electricity market in South Africa is changing and different customer needs will have to be satisfied in future. This presents an opportunity to all of us and a common and coordinated approach to serve these developing markets appropriately.

In the past, most of the growth came from large industrial and mining activities in the formal sector. Now the informal economy, with its numerous existing and potential small electricity users, is as you know developing rapidly and their electricity needs are increasing, a fact which local government is aware of — a challenge of formidable proportions. The fact that electricity is unavailable to a large part of our population is, without any doubt not only severely hampering its development but that of our country. At the National Energy Council we have accorded top priority to the provision of appropriate energy, as I have indicated.

The municipalities and Eskom has, to my mind, particularly important roles to play in actually bringing electricity to urban and rural communities, by implementing these policies to which have been ascribed such high priority. This means making use of distribution and reticulation technology which will indeed make electricity more affordable to those users by actively involving all appropriate authorities in particular the local private sector, the local community and the local government. Devices such as aerial bundled conductors, elimination of extensive housewiring "ready boards" which consist of three plugs and a light even allowing a mud hut to have electricity are as you are aware being introduced to drastically reduce reticulation and installation costs without sacrificing safety of supply. Alternative programmes for electrification like creating joint ventures between local authorities, the local private sector and the local community and the local electricity supplier, hold particular promise as a workable model for the future. Payment for power by magnetic card operated prepayment, or so-called budget meters, which also receives attention at this conference make payment for electricity so much simpler and more cost effective.

It is the combination of use of all of these and other applicable methods by the municipalities and by Eskom which opens up new vistas for all, giving purpose to the vision of electricity for all at an affordable price. It is imperative that this vision, a vision of national and of local importance, supported by the National Energy Council and promoted and implemented by



Eskom and by some of the municipalities, should become a common vision for all. In all of this the AMEU I believe has a vital role to play.

Voordat ek afsluit vergun my 'n paar gedagtes oor die toekoms en die ingewikkelde aard van voorspellings in soverre dit toekomstige energieverbruik betref en hoe plaaslike besture tot die ontrefening van die eeu-oue probleem van toekomstige beplanning kan bydra.

Soos Philip Spies van die Instituut vir Toekomsnavorsing, Universiteit Stellenbosch, sê is daar onteenseglik 'n sterk verband tussen die vlak van sosio-ekonomiese ontwikkeling en die aard en omvang van energieverbruik in 'n gemeenskap. Wat met energie gebeur, hou dus direk verband met wat in Suid-Afrika gebeur, so eenvoudig is dit.

Toekomspektiewe oor energie moet veral rekening hou met verandering in sosio-ekonomiese makro-tendense wat direk of indirek die patrone van energiebenutting en voorsiening daarvan oor die langtermyn kan verander. Demografiese veranderinge insluitend verstedeliking, verandering in die beskikbaarheid van energie-hulpbronne, politieke-institusionele veranderinge in omgewings-tendense, hou belangrike en wesentlike implikasies vir energiebenutting in die langer termyn in.

Neville Riley of the Planning Department of the City of Cape Town has illustrated the usefulness of computer graphics in the understanding of demography — one of the keys, I believe, to long-term energy planning — demography which as you know being concerned with studying the changes in the number and types of people residing in a given geographic area over a period of time. These variables have profound implications, for instance, for a local authority when it comes to the planning for the provision of services such as housing, electricity supply etc. The City of Cape Town has taken into service a sophisticated new computer system that will, given time, revolutionize planning and design methods in the City. This will not only open a highly valuable databank to the business community but provide a valuable tool to assist regional energy planning. It is indeed another example of the need for closer cooperation between local, regional and national authorities in the field future planning of electricity supply.

Om saam te vat, wil ek voorstel dat u oorweeg om by die reeds prysenswaardige doelstellings van die Vereniging van Munisipale Elektriese Ondernemings die volgende te voeg of te benadruk, naamlik dat:

- die VME0 meer en direk betrokke sal raak by energie- en in besonder elektrisiteits-beleidsvorming en implementering, inderdaad dit is myns insiens 'n natuurlike uitvloeisel van u Vereniging se doelstellings tot dusver. Of dit terselfdertyd vir u op 'n kruispad oor die aard en status van u Vereniging bring, is vir u om oor te besin. As ons kan raad gee moet u net sê. Op die lokale beleidsvlak sien ek ook nouer skakeling met instansies soos die Vereniging van Munisipale Bestuur, op nasionale vlak met Eskom en die Nasionale Energieraad
- die VME0 groter koördinasie ten opsigte van elektrisiteitsverspreiding en alle tersaaklike aangeleenthede op alle vlakke van plaaslike bestuur sal insieer en beïnvloed, van munisipale tot afdelingsraad tot voorstedelike raad tot streekdienstraadvlak. Vanselfsprekend sal dit nie maklik wees nie, veral waar die rolle van die verskillende vlakke van plaaslike bestuur nog nie volledig uitgespeel is nie, en waar daar gevestigde belange is
- die VME0 meer aandag skenk aan die bemarking van elektrisiteit in die werklike sin van die woord en aan die bevordering van die doeltreffende benutting van energie deur veral die endverbruiker. Dat u die publiek meer inlig oor die ekonomiese voordele daarvan deur meer gebruik te maak van die media, veral televisie. U het beide die Nasionale Energieraad sowel as die Elektrisiteitsbeheerraad se ondersteuning in die verband, en ek is oortuig daarvan ook die van Eskom
- die VME0 seker maak dat waar u in 'n steeds toenemende mate in 'n snel verstedelike situasie al hoe meer by plaaslike elektrisiteitsvoorsiening en selfs -opwekking betrokke

gaan raak, dat die aspek van privatisering wat reeds by Eskom in diepte ondersoek word, deurloopend aandag geniet, sowel as ten opsigte van deregulering

- die VME0 nie net meer aandag skenk aan die beskikbaarstelling van toepaslike energie onder andere in die vorm van hernubare energie aan die minder geogede deel van ons ontwikkelende bevolking nie, maar ook aandag gee aan die bevordering van kogenerasie asook die benutting van industriële en munisipale afval
- laastens, die Vereniging van Munisipale Elektriese Ondernemings en sy lede het 'n strategiese rol om te speel in die voorsiening van elektrisiteit op plaaslike vlak. U is inderdaad een van die rolspelers in energiebeleid tesame met Eskom, die Elektrisiteitsbeheerraad en die Nasionale Energieraad, nie net om die Minister van Minerale- en Energiesake aktief en pro-aktief by te staan in die vorming en deurvoering van nasionale energiebeleid nie, maar om daadwerklik daardie beleid op plaaslike vlak te bevorder en te implementeer.

Meneer die President, ek wens u en u Vereniging alle sukses toe. Dit is nou my voorreg om hierdie een en vyftigste konvensie as geopen te verklaar. Mr President, ladies and gentlemen, it is my pleasure and privilege to declare this 51st AMEU Convention duly open. May your deliberations be highly successful and your return home safe and pleasant.

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**ERKENNING:** Gedurende die skrywe van hierdie referaat is daar vele insiggewende gesprekke gevoer met lede van die Nasionale Energieraad, die Elektrisiteitsbeheerraad, Eskom, die VME0, plaaslike bestuure en baie ander kundiges in dié veld. Baie dankie daarvoor.

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Prof J W R de Villiers  
Mnr G Hugo  
Mnr S Immelman  
Prof I J Lambrechts  
Mnr A J Levy  
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Mnr P J Elliott  
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Mnr J J Fourie  
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Mnr J H van der Walt  
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Dr R A P Fockema  
Mnr J F W Haak

Prof D Konar  
Prof I J Lambrechts  
Mnr B J Lessing  
Mnr F J Malan  
Dr J B Maree  
Mnr R B Savage  
Mnr A A Sealey  
Dr C L Stals  
Prof H C Viljoen  
Mnr R C Webb  
Prof J L Weyers

## HOOFREDE

### deur dr J P du Plessis Direkteur-generaal SABS

Mnr die President, hooggeplaaste gaste, dames en here, eerstens wil ek graag mnr Fred Daniel geluk wens met sy verkiesing tot en inhuldiging as President van u Vereniging. Dit is seer sekerlik 'n welverdiende eer wat hom te beurt geval het.

In Suid-Afrika het ons twee nasionale tydverdrywe nl. rugby en politiek, nie noodwendig in daardie volgorde nie. Daar word maande en jare in debat spandeer oor die onderwerp van wie gaan die regering wees, wie gaan wie oorheers, minderheids-groepbelange, ensovoorts.

Nie dat hierdie sake onbelangrik is nie maar die sleutel tot die toekoms gaan in die ekonomie lê. Dit is wat gaan bepaal of ons in die toekoms 'n piesangrepubliek of 'n florerende land gaan wees. As ons na die ekonomiese ontwikkeling in 'n verskeidenheid lande in die wêreld kyk is dit duidelik dat dit daardie lande met 'n uitwaartse ekonomiese benadering is wat weselik floreer. Hiervan is Japan en Suid-Korea uitstekende voorbeelde.

Aan die ander kant is dit daardie lande met 'n inwaartse ekonomiese benadering waarvan die skuldias groter en groter word en verbasend genoeg, is Australië hiervan weer 'n goeie voorbeeld. Dit dui dan duidelik vir ons die rigting aan wat ons in die Republiek sal moet volg as ons weselike ekonomiese groei wil bewerkstellig.

As ons kyk na wat gebeur tydens die ekonomiese siklusse dan is dit duidelik dat tydens 'n ekonomiese opswaai daar meer ingevoer word, dit plaas 'n druk op die buitelandse betalingsbalans, dit noop weer die Regering om 'n demper te plaas op invoere, rentekoerse styg en die ekonomie plat weer af, wat die druk op die buitelandse betalingsbalans verlig.

Daardie lande wat hulle ekonomie rig op die wêreldmark, is egter baie minder onderhewig aan hierdie sikliese fluktuasies. Dit bring outomaties die vraag na vore of die vervaardigings-sektor in die land nie baie groter aandag moet gee aan invoer-ervanging, en om die wêreldmark te betree nie.

Ek het onlangs die voorreg gehad om na 'n toespraak van mnr Clem Sunter van Anglo American Korporasie te luister oor projeksijs wat hulle gemaak het ten opsigte van die ekonomiese groei-behoefte van die Republiek. Net om die bevolking asook die geprojekteerde bevolking wat onder die broodlyn leef, te lig tot op 'n vlak van bokant die broodlyn sou impliseer dat die land 'n ekonomiese groei koers van 10 % vir die volgende 20 jaar sou moes handhaaf.

Hieruit is dit duidelik dat daardie orde van groei koers nooit gehandhaaf sal kan word as die ekonomie na binne gekeer is nie en dat ons ongetwyfeld die wêreldmark op 'n groot skaal sal moet betree. Daarmee bedoel ek nie die uitvoer van rou-materiale nie, maar wel die uitvoer van produkte met sogenaamde toegevoegde waarde. As 'n voorbeeld, ons behoort nie ystererts uit te voer nie maar wel staal, en verkieslik nie staal nie, maar wel vlekvrystaal. Terselfdertyd impliseer dit dat die land se afhanklikheid van gouduitvoere relatief tot totale uitvoere drasties sou moes verminder en dat die aksent sal moet oorgaan na die uitvoer van vervaardigde produkte.

Ten einde hierdie doelstelling te bereik, is opvoeding een van die kernelemente wat dit moontlik kan maak. Dit is sekerlik nie toevallig dat Japan in die voorgoed is wat betref die opleiding van kinders in die wiskunde en wetenskappe in die wêreld nie. Dit is egter net so duidelik dat oor die kort termyn daar geen moontlikheid is om genoegsaam goedopgeleide onderwysers vir hierdie deel in die Republiek beskikbaar te kan hê nie. Dit impliseer terselfdertyd dat ten einde so 'n doelstelling te bereik, daar oorgegaan sal moet word na elektroniese voorligting waar die beste onderwysers voorligting op video oor 'n breed front sou kon aanbied. Dit het natuurlik die nadeel dat 'n video nie vrae beantwoord nie. Terselfdertyd beteken dit 'n sterk aksentverskuiwing na die tegnologiese opleidingsrigtings.

Voortspruitend hieruit is dit dus duidelik dat elektrisiteitsver-skaffing en -verspreiding nie net nou nie, maar ook in die toekoms, 'n kernrol in beide die vervaardigings en opvoedkundige sektore van die land sal speel.

'n Tweede sleutelement in die ekonomiese oorlewing van die Republiek gaan handel oor die mate waartoe ons 'n kwaliteit- en produktiwiteitskultuur in die bevolking sal kan vestig. Hierdie noodsaaklikheid word dan ook baie duidelik uitgelig in die onlangse verslag oor produktiwiteit deur die Ekonomiese Komitee van die Presidentsraad.

Ek is seker dat elkeen van ons sal kan getuig oor ons eie onder-vindings in terme van swak kwaliteit van nuwe produkte en van dienste. Ek kan dit vir u illustreer met twee voorbeelde uit eie ondervinding. Die aankoop van 'n doodgewone bandspeeler wat



Dr J P du Plessis

die omruilings benodig het voordat die apparaat vir langer as 'n dag wou werk. Die ander voorbeeld is die herstel van 'n wasmasjien wat drie besoeke en 'n reuse-rusie met die bestuurder van die onderneming geveg het voordat dit bevredigend herstel kon word.

Dit bring outomaties die vraag na vore naamlik, aanvaar ons Suid-Afrikaners nie te maklik swak diens en swak kwaliteit nie? Voordat ons nie daardie kultuur verander kry nie, gaan ons ook nie effektief op die wereldmark kan meeding nie.

Ek wil my verstout om te sê dat ons land nie miljoene per jaar verloor nie maar wel biljoene per jaar verloor omdat ons nie dit wat ons reeds doen, goed en effektief doen nie. Kwaliteit en die voldoening aan die klient se behoeftes gaan uiteindelik die spil wees waarom ons hele uitvoeropgong sal moet draai. Daarby sal dit staan, óf val.

Dit is onlangs pertinent aan my gesê deur 'n bekende groot vervaardiger, dat toe hulle hul produkte op die wereldmark probeer aanbid het, hulle tot hul skok agtergekrom het, dat die kwaliteit van hulle produkte geensins vir die wereldmark aanvaar was nie en dat dit 'n weldureldagte poging geveg het om hulle spesifikasie op 'n vlak te kry waar hulle effektief die uitvoermark sal kan betree.

Die skepping van 'n kwaliteit- en 'n produktiwiteitskultuur gaan egter nie 'n maklike taak wees nie. Dit gaan 'n groot poging verg, nie net uit die vervaardiging, die diens en die publieke sektor nie, maar letterlik van elke individu in die land.

Die eerste advertensie van die SABS op televisie is dan nie net daarop gemik om die SABS-merk te bevorder nie, maar ook om die konsep van kwaliteit onder die algemene publiek en soende indirek die vervaardiger in te skerp.

Swak kwaliteit het egter 'n ander effek wat ons ook indirek raak. Uiteindelik betaal die verbruiker vir die mislukking op die werksvloer van die fabriek want die verliese moet noodwendig bygereken word by die totale vervaardigingskoste en affekteer dus eenheidsprys wat ons as verbruikers moet betaal. Dit werk dan ook noodwendig inflasie in die hand en strem produksie. Dit is 'n interessante verskynsel dat baie vervaardigers nie vir jou kan sê wat hulle kwaliteit is nie, veral nie wanneer kwaliteit-koste in terme van die koste van mislukking, herwerk en dies meer, bereken moet word nie. Wat hulle wel goed genoeg kan doen, is om daardie koste by te reken in die raming van 'n verkoopprys.

Dat daar egter verskillende sienings is oor wat kwaliteit beteken is gewis. Die verbruiker sien kwaliteit as die voldoening aan sy behoeftes teen 'n prys wat hy bereid is om te betaal. Daarenteen sien die vervaardiger kwaliteit as die voldoening aan 'n standaard gebaseer op die vervaardiger se persepsie van wat aan die verbruiker se behoeftes sal voldoen. Juis hierin kan die SABS 'n sleutelrol speel deurdat in die opstel van 'n spesifikasie beide die vervaardiger en die verbruiker 'n inset kan lewer ten einde 'n standaard te stel wat aan die verbruiker se behoeftes voldoen maar ook ekonomies deur die vervaardiger gelewer kan word.

Met die ingrypende veranderinge wat in die Bestuur van die Suid-Afrikaanse Buro vir Standaardisering intree het vanaf 1 Julie vanjaar sal u stellig belangstel in hoe daardie bestuur nou daar uit sien. Benewens ekself, word die hoofbestuur gevorm deur mnr Daan Luyt as Hoofdirekteur — Korporatiewe Dienste, mnr Martin Kellerman as Hoofdirekteur — Ingenieursdepartemente en mnr Jan Meyer as Hoofdirekteur — Chemiese departemente. Onder die ingenieursdepartemente is daar Sivele Ingenieurswese en Verpakking met mnr Iain Bennie as direkteur, Elektroniese Ingenieurswese en Fisika met dr Cliff Johnston as direkteur, Elektriese Ingenieurswese met mnr Isaac Kruger as direkteur en Meganiese Ingenieurswese met mnr John Parmee as direkteur. Aan die chemiekant is daar Chemiese Tegnologie met mnr Terry Cotton as direkteur, Veseltegnologie met mnr Sjoert Hefer as direkteur en Biologiese Wetenskappe onder leiding van dr Henri van Rensburg. Dit beteken dat van die vier hoofbestuursposte, al vier persone nuut in die pos is terwyl van die sewe direkteurposte, vier nuut aangestel is.

Dit bring onmiddellik die vraag na vore of onder leiding van die nuwe bestuur, die benadering en beleid van die Buro ingry-

pend sou verander. Ons voorsien egter geen ingrypende beleidsveranderinge nie. Die Buro is op 'n stewige fondament en is 'n dinamiese uitgaande diensorganisasie. Dat daar wel veranderinge en aksente sal intree, is egter onvermydelik, soos die volgende paar voorbeelde sou illustreer:

In die verlede is daar 'n baie sterk aksent gelê op standaarde vir nywerheidsgebruik, daarmee bedoel ek op produkte wat deur die nywerheid gebruik sal word en 'n baie mindere aksent op standaarde vir die algemene verbruikerspubliek. Hierop sal ons dan ook 'n baie sterker aksent moet plaas aangesien die behoefte groot is en dit ook 'n baie groot potensiele mark vir die SABS sou beteken.

Tweedens, om die beeld van die Buro te verander van die introvertete beeld wat oor die afgelope jare geskep is tot dié van 'n dinamies uitgaande organisasie, wat dit in werklikheid is.

Derdens, om die Buro weer in die voorgrond te plaas as die tuiste van kwaliteit in die land en die leiding te neem om 'n sterk poging tot die daarstelling van 'n kwaliteitkultuur in die land van stapel te stuur.

Vierdens, om die lyskema ten opsigte van SABS 0157, die gebruikskode vir kwaliteitbestuurstelsels op 'n breë basis te vestig as dié maastaf om kwaliteitbestuur in die vervaardiging- en dienssektore mee te kan meet. Net soos 'n winkelier 'n meterstok gebruik om lengte mee te meet, net so is 'n objektiewe maastaf nodig wat nasionaal en internasionaal erken word om die effektiwiteit van kwaliteitstelsels mee te kan evalueer. Nie alleen hou dit die sleutel in vir mededinging op oerse markte nie, maar dit lê ook die fondament waarop die konsep van totale kwaliteit gebou sal kan word. Totale kwaliteit is die konsep wat die ruggraat van Japan se sukses in die wereldmark vorm.

Wat kwaliteitbestuur betref, is dit interessant dat die SABS tans die tweede grootste lyskema in die wereld bedryf naas Groot Brittanje. Wat egter besonder interessant is, is dat ons 'n hele aantal navrae ontvang het uit lande beide in die Westerse wereld en uit die Stille Oseaangebied om toegang te probeer verkry tot ons opleidingsisteme vir assessore en die stelsel wat ons gebruik om die lyskema mee te bedryf.

Baie lande beskou die daarstelling van so 'n lyskema as 'n kritiese element veral wat toegang tot die Europese mark na 1992 betref. Vandaar die belangstelling om toegang tot ons stelsels te kry.

Van kardinale belang is ook die toegang wat ons tot internasionale standaarde het deur ons lidmaatskap van en betrokkenheid met ISO, IEK en die Codex Alimentarius Kommissie. Alleenlik deur standaarde van dwarsoor die wereld aan ons nywerheid beskikbaar te kan stel is dit vir die nywerheid moontlik om te weet aan watter uitvoerstandaarde hulle sal moet voldoen.

Dan wil ek ook graag verwys na die assosiasie wat reeds oor baie jare bestaan tussen die SABS en dié Vereniging. Lede van die VMEQ woon op 'n gereelde basis die algemene jaarvergadering van die IEK as lede van die RSA-span by en maak daardeur nie net belangrike bydraes tot die besprekings nie, maar maak ook belangrike kontakte met kenners in die wereld op die gebied van elektrisiteitsverspreiding.

Lede van u Vereniging dien dan ook al jare lank op talle komitees van die SABS en ondersteun in sy reël die standaarde wat voorgestel word hoewel daar nog plek-plek nie ondersteuning verkry word nie. Ons sien egter die VMEQ as belangrike vriende van die SABS.

Die assosiasie van die SABS en u Vereniging strek egter ook verder. Saam met Eskom en VMEQ dien die SABS op 'n komitee vir die rasionalisasie van spesifikasies vir die swaarstroomelektriese ingenieursbedryf. Die feit dat hierdie rasionalisasie verbruiksgedrewe is, is vir die SABS 'n baie belangrike ontwikkeling.

Dit is veral so omdat dit juis die verbruiker was wat selfs 'n bestaande spesifikasie sou neem en dan addisionele vereistes daarby sou inskryf in hulle tendervoorwaardes. Dit het veroorsaak dat 'n menigte spesifikasies ontstaan het in plaas van 'n aantal basiese funksioneel, doeltreffende spesifikasies. Die netto-



Die afgevaardigdes luister aandagtig.

effek van al hierdie spesifikasies was dat dit inherend gewerk het op lewensvatbare produksie en ook disproportioneel hoë kostes tot gevolg gehad het. In albei gevalle het die verbruiker maar moes betaal.

Ek wil my nie uitspreek oor die vele voordele wat dit vir beide die verbruiker asook die vervaardiger sou inhoud nie, behalwe om 'n paar woorde te sê oor die siening van die Buro oor hierdie nuwe ontwikkeling.

Die Buro sal 'n sleutelrol speel in al die fases van die projek en sal ook uiteindelik die spesifikasies publiseer. Deurdat verbruikers in hierdie projek saamstaan en onderneem om die beginsel van gemeenskaplike spesifikasies te onderskryf, is reeds 'n groot stap vorentoe in die daarstelling van nasionale spesifikasies. Wanneer hierdie spesifikasie vir 'n periode in gebruik was, sou dit 'n relatief maklike taak wees om hulle oor te skakel in terme van nasionale spesifikasies in welke geval die Buro dit kan oorneem en publiseer en administreer soos die normale praktyk maar is.

Ek wil graag herhaal dat hierdie 'n insiatief is wat die Buro onderskryf en graag me sal saamwerk omdat ons dit in nasionale belang beskou.

Dié assosiasie met u Vereniging is vir ons belangrik en ons sou graag wou sien dat dit van sterkte tot sterkte sal gaan, in besonder omdat die SABS en die VMEQ vennote is in die Suid-Afrikaanse nywerheid. Goeie samewerking sal tot groot voordeel vir beide organisasies wees.

Graag wens ek u 'n baie suksesvolle konvensie toe.

#### MNR ATTIE VAN DER BERG: KRUGERSDORP

Mnr die President, dames en here, die VMEQ is dankbaar dat 'n persoon soos dr Du Plessis, wat te midde van 'n veeleisende program die tyd kon afstaan om die Hoofrede op so 'n treffende wyse aan ons oor te dra.

Die belangrikheid en sukses van 'n uitwaartse ekonomiese beleid en die betreding van die wêreldmark, in 'n groter mate, sal afhang of die RSA deur die wêreld daar buite aanvaar en toegelaat sal word om hierdie doelwitte te bereik, en te verwezenlik.

Die bereiking van sukses deur opvoeding, en die vestiging van 'n kwaliteit- en produktiwiteitskultuur in 'n bevolking, is 'n lang en moeisame weg — veral as 'n mens kyk na die bevolkingssamestelling — die geweldige bevolkingsaanwas en die opheffing van mense wat onder die broodlyn leef — die toenemende koopkrag van anderkleuriges en volgens my beskeie mening die mislukking van vele toegewyde pogings om ons mense produktiwiteitsbewus te maak, veral binne plaaslike bestuursopset. Die voorafgaande sake is nie bedoel as negatiewe kritiek nie maar onderstreep dr Du Plessis se stellings in sy referaat.

Die onlangse herorganisasie van die SABS sal op die lange duur veel bydra tot beter dienslewering en dr Du Plessis is sy bestuursman word alle sterkte toegewens vir die uitdagings in die toekoms. As VMEQ-vertegenwoordiger en sameroeper van die Koördinerende SABS Komitee — wil ek hulde bring aan die personeel van die SABS vir hulle volgehoue ondersteuning en leiding, en vir die hartlike samewerking wat die lede van die VMEQ te beurt val, hetsy op die IEK terrein en met die daarstel van spesifikasies. Dr Du Plessis verwys ook na die Eskom/VMEQ/SABS Komitee vir die rasionalisasie van Spesifikasies vir die Swaarstroom elektriese ingenieursbedryf. Die riglyne vir die voorsiening van Ingenieursdienste in dorpsgebiede (die sogenaamde Blouboek) word as riglyn gebruik deur voorsieningsowerhede en Raadgewende Elektriese Ingenieurs. Met die totstandkoming van die Streeksdiensterade is dit verbasend om die vertolkings wat voortvloei uit 'n neergelegde riglyn te monitor. Ten spyte van die voorafgaande stelling is ek eens met basiese, funksioneel-doeltreffende spesifikasies. Daar moet eger gevaak word dat elektriese stelsels wat ontwerp word, geskoei op genoemde spesifikasies — nie sodanig afgewater word weens druk van Eskom en privaat ondernemings — om elektrisiteit aan miljoene anderkleuriges beskikbaar te stel, deur goedkoop stelsels daar te stel, wat nie koste-effektief op die langtermyn is nie. In hierdie verband moet daar ook gevaak word teen die afwatering van die gebruikskode SABS 0142, Bedrading van Persele.

Mr President, 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 cooperate 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.

Ek sluit af mnr die President deur nogmaals ons dank te betuig aan dr J P du Plessis, Direkteur-Generaal van die SABS vir 'n prikkelende en interessante referaat. Baie dankie.

#### UITNODIGING: 1990 TEGNIESE VERGADERING VAN VMEQ

##### RDL CHRIS LOMBARD: GEORGE

Mnr die President, dit is vir my 'n genoeë en aangename voorreg om namens die Stadsraad van George, die VMEQ hartlik uit te nooi om sy 13de Tegniese Vergadering in 1990 in George te kom hou. Vir George, die "Hart van die Tuinroete", sal dit 'n eer wees om u te ontvang en as gasheer vir u op te tree. Ons heet u by voorbaat al baie hartlik welkom en spreek die vertroue uit dat u verby die paar dae daar by ons baie aangenaam en genotvol sal wees.

# ELECTION OF EXECUTIVE COUNCIL / VERKIESING VAN UITVOERENDE RAAD

The following nominations were received:-

Highveld/Hoëveld

OFS and NORTHERN CAPE

OVS en NOORD-KAAPLAND

NATAL

GOOD HOPE/GOEIE HOOP

EASTERN CAPE/OOSKAAP

1. Die volgende nominasies is ontvang:-

M P P Clarke  
J E Heydenrych  
C J Scherman  
A J van den Berg

D B Briers

A J van der Merwe

E G Davies  
H R Whitehead

K J Murphy  
B van der Watt

H D Beck  
R Malinson

The following eight persons were elected by ballot paper:-

H D Beck  
D B Briers  
M P P Clarke  
E G Davies  
J E Heydenrych  
K J Murphy  
C J Scherman  
A J van den Berg

2. Die volgende agt persone is per stembrief verkies:-

The following persons counted the ballot papers:-

Mrs/mev J Meyer  
G Ricci  
Mrs/mev P Sierra  
L Smith  
J B Swart  
L Swart

3. Die volgende persone het die stembriewe getel:-

The following past presidents together with their councillor representatives are in terms of the Constitution also members of the Executive Council:-

P J Botes  
A H L Fortmann  
J A Loubser

4. Die volgende voormalige presidente tesame met hulle raadslid verteenwoordigers is ingevolge die Grondwet ook lede van die Uitvoerende Raad:-

Roodepoort  
Boksburg  
Benoni

## PROPOSED AMENDMENTS TO THE CONSTITUTION VOORGESTELDE WYSIGINGS TOT DIE GRONDWET

The following amendments to the Constitution were approved by ballot, 128 votes in favour and 24 votes against.

### INDEPENDENT STATES: MEMBERSHIP

It is recommended that clause 7.1 be amended as follows:-

The membership of the Association shall consist of undertakings, other organisations and natural persons who are situated or resident in South Africa or independent neighbouring states.

### NAME OF THE ASSOCIATION

To accommodate the amended clause 7.1 it is recommended that the name of the Association be defined as follows in definition 1.9 of the Constitution:

"The name of the Association" hereinafter called the Association of Municipal Electricity Undertakings (Southern Africa)

Add a new clause:

### 24.6 SUB-BRANCHES

The Executive Council may authorise the formation of a Sub-Branch on the recommendation of a Branch. A Sub-Branch shall report directly to the Branch and shall not be represented on the Executive Council.

Die volgende wysigings aan die Grondwet is aanvaar per stembrief, 128 stemme daarvoor en 24 stemme daarteen.

1. ONAFHANKLIKE STATE: LIDMAATSKAP

Dit word aanbeveel dat klousule 7.1 soos volg gewysig word:-

Die lede van die Vereniging bestaan uit ondernemings, ander organisasies en natuurlike persone wat in Suid-Afrika of naburige onafhanklike state gevestig is of woon.

2. NAAM VAN DIE VERENIGING

Om die gewysigde klousule 7.1 te akkommodeer, word aanbeveel dat die naam van die Vereniging soos volg gedefinieer word in definisie 1.9 van die Grondwet:

"Die naam van die Vereniging" hierna genoem die Vereniging van Munisipale Elektrisiteitsondernemings (Suidelike Afrika)

3. Voeg 'n nuwe klousule by:

### 24.6 SUB-TAKKE

Die Uitvoerende Raad kan goedkeuring verleen vir die stigting van 'n Sub-Tak op aanbeveling van 'n Tak. Die Sub-Tak doen regstreeks verslag aan die Tak en sal nie verteenwoordig word op die Uitvoerende Raad nie.

# PAPERS / REFERATE

## BUDGETARY METERING

By: Mr. Rudi Coetzee  
Managing Director, Angcon Technologies (Pty) Ltd.

### CURRICULUM VITAE: R COETZEE

- Schools: Groote Schuur Primary, Rondebosch.  
Zwaanswyk Primary, Retreat.  
Zwaanswyk High School, Retreat.
- Post School: University of Stellenbosch (B.SC. Eng-Elect).  
University of Potchefstroom (Control Systems).
- Other: Government certificate of Competency —  
Mines & Works (Electrical).  
Professional Engineer.
- Institutes: Member of the South African Institute of  
Electrical Engineers.  
Member of the South African Institute for  
Measurement and Control.  
Affiliate member of the AMEU.  
Affiliate member of the Institute for Housing  
of Southern Africa.
- Experience:  
1976 - 1977: Department of Post and Telecommunications  
— ship to shore radio section.
- 1977 - 1983: Anglovaal Group  
Junior Engineer — Hartebeestfontein Gold  
Mine.  
Sectional Engineer — Hartebeestfontein Gold  
mine.  
Consulting Engineer — Anglovaal Head  
Office.  
Established the Anglovaal Electronic and In-  
strumentation Laboratory.
- 1984 - 1987: E L Bateman Group — Branch Manager  
(Cape & SWA)  
Established and ran a branch in Cape Town  
for the Batetech division.
- 1987 -  
Angcon Technologies (Pty) Ltd.  
After being one of the co-designers of the  
original AMPCON 1 unit, he established the  
company with Minetec Ltd and the IDC and  
is at present the Managing Director of the  
company.
- General: Lives in Durbanville.  
Married with 2 boys.

### SYNOPSIS

The paper covers the local development and manufacturing of Budget Energy Meters over the past four years as well as other matters such as field experience, installation methods, dispensing of tokens and also briefly deals with what further developments are expected in the near future.

### INTRODUCTION

The development of our specific range of budget energy meters (pre-payment electricity meters) commenced in 1985 after various homelands and local authorities expressed the urgent need for such a locally produced concept. At the time some of them had been experimenting with similar imported devices and (for various reasons) had found them not quite suitable for third world applications.

Some of the imported coin and token type units were studied to analyse their shortcomings. Thereafter we commenced with a national investigation to enable us to compile a basic specification. The findings of this investigation are updated on a regular basis and if possible, the design is updated accordingly.

Initially, we limited our investigation to black, coloured and white local authorities. Thereafter it was expanded to incorporate further findings after numerous discussions were held with black, coloured and white consumers in rural as well as urban regions.

The major problems experienced by local authorities can be summarized as follows:

- Bad debt varies from 0% up to 80% and can be broken down to the following figures:

Homelands	: 30 - 60%
Black — rural	: 10 - 40%
— urban	: 20 - 80%
Coloured — rural	: 2 - 10%
— urban	: 5 - 20%
White — rural	: 0 - 0,5%
— urban	: 0 - 2%

- Unrealistically large percentage of disconnections/reconnections taking place, contributing to a far higher operating cost than originally expected. In some cases this was as much as ten percent per month if taken as a percentage of the total number of consumers in the specific township.
- Vandalism to equipment which consisted mainly of damage to the street kiosks and the conventional meters, especially when located external to the house.
- Debt collection.
- Tampering with the conventional meters e.g. external bridging and slowing down of the rotating disc.
- Reliability of the meter readers e.g. recording a lower reading than the units actually consumed.

The subsequent findings after our discussions with consumers can be summarized as follows:

- They do not trust a system that measures their consumption if the meter is locked away.
- Most of them are weekly paid and cannot afford to pay a monthly account after they have consumed the power. They cannot budget and/or control their consumption.

- The majority do not appreciate receiving an account 30 to 90 days after actual consumption has taken place.
- Reconnection penalties after disconnections are not understood.
- When lodging a complaint regarding an abnormally large account or when querying the accuracy of the meter, their complaints in many cases are not answered in a satisfactory manner.
- They can purchase petrol, coal and paraffin in any known quantity and therefore prefer these forms of energy.
- Electricity is a difficult concept to understand. We have seen many examples of this and in one case the consumer could not understand how it was possible for him to consume 4000 units in one month. On further investigation, we found that the stove was used as a heater while heaters were on day and night in every bedroom.

It must be stressed that these findings varied in degree from township to township e.g. vandalism increased when the township is located near a city or large town.

### 1.0 FIRST PROTOTYPE DESIGN

Because no local specification existed for pre-payment meters (at the time), we had to compile our own specification based on our findings and the specifications covering the conventional Feraris disc meter.

Those familiar with electronic design will know that it is fairly easy to develop a device to perform the functions of a pre-payment electricity meter. However, to design a cost-effective pre-payment meter with a life span of 20 to 30 years and also to incorporate a fairly high degree of security and environmental protection, proved to be quite a challenge to our design team. Very little support was given by potential suppliers of components, whether electronic or mechanical. All mechanical parts (metal and plastic) had to be hand made for the purpose of being used in the first prototype meters.

The first microprocessor based pre-payment meter was completed by mid-1986 and incorporated far greater security than most imported devices, as well as the first solid-state kilowatt-hour metering circuitry.

The unit was equipped with an eight digit Liquid Crystal Display (LCD). Initial accuracy tests indicated that we were on the right track. However, the unit indicated a 5% error at the bottom end of the range at a power factor of 0.5. This was due to the primary current measuring element being a current transformer. After experimenting with mumetal cores without success, it was decided to use a shunt as the primary current sensor. This improved the accuracy of the device to a level within the Class 2.0 rating, under the worst test conditions.



Mr Rudi Coetzee

At the beginning of 1987, we were informed by the Department of Energy Affairs that Eskom had been appointed by the government to be responsible for testing and approving of all pre-payment meters, whether of local manufacture or imported. No meters were to be installed by any local authority on a large scale unless the unit had successfully completed all tests. Eskom compiled the first local specification for single phase budget energy meters during this time. The devices also had to pass the tests stipulated in specification NWS 1318 — Environmental Requirements and Tests for Electronic Measuring Equipment.

- Temperature, Humidity and Altitude:
    - Temperature :  $-10^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$
    - Relative Humidity : 0 to 95% below  $35^{\circ}\text{C}$   
0 to 75% above  $35^{\circ}\text{C}$
    - Altitude : 0 to 2500m AMSL.
  - Dielectric Test:
    - 2kV RMS  $\pm$  10% continuously for a period of one minute. No flashover or breakdown must occur.
  - Impulse Test:
    - 5kV  $\pm$  5%
  - Surge Withstand Capability test (SWC):
    - A damped sinusoidal wave with a frequency range from 1.0 MHz to 1.5 MHz is injected with a peak voltage of 2.5kV.
  - Supply Transient test:
    - Three different supply transient tests are incorporated e.g.
      - Peak voltage : 1.5kV
      - Rise time : 10ns
      - Energy (approx) : 3mJ
      - Source Impedance : 150 Ohms.
  - Spark test.
  - Radio Frequency interference test:
    - These tests cover 4 frequency bands from 27 MHz up to 470 MHz.
  - Climatic tests:
    - 16 Hours at  $+55^{\circ}\text{C}$  and determine the accuracy.
    - 16 Hours at  $-10^{\circ}\text{C}$  and determine the accuracy.
- Stress Temperature cycling between  $+55^{\circ}\text{C}$  and  $-10^{\circ}\text{C}$ . Five cycles are carried out and the accuracy is determined once again after stabilization.
- Shock test.
  - Vibration test.
  - Flammability test (not specified in NWS 1318).

Three prototype units were submitted to Eskom by March 1987. The laboratory tests took 8 months to complete. During this period various improvements were made to the design. Eskom also played a supportive role during the test period, by making recommendations based on their experience with electronic equipment in power monitoring applications.

### 2.0 PRODUCTION UNITS

After completion of the laboratory tests on the prototype units, Eskom requested us to submit production units for the same tests. During this period, a small production line was established in Atlantis. The associated testing and calibration systems were developed in-house. The first hundred production units were produced during November 1987. Thirty of these units were installed in a housing project located in White River on the recommendation of the House of Representatives. These units were installed outside the houses in metal enclosures built into the front garden walls. Access to the meters was controlled by the consumers while the municipality kept a second set of keys. Feedback was very important to us and we were kept informed by the electrical department on a regular basis.

Due to the fact that no dispenser was required for this small pilot run, magnetic cards were preprogrammed by ourselves to a single area code.

A few improvements were made to the design early in 1988 after receiving feedback from three pilot projects. They were:

- Allowing for rear access of wiring to increase security.

- Mechanical marking of the cards caused confusion and the concept was subsequently deleted.
- The low credit warning indication was increased from one unit to forty units.
- A unique coding technique was developed and implemented. Field trials indicated to us that 10% of the consumers struggled with the inserting of the card into the meter. This technique improved security and increased the operating speedband with at least 200 percent.

By mid-1988, we had approximately ten pilot projects running in various townships throughout South Africa. At the time, the original concept was approved and we decided to increase production to 250 units per month.

### 3.0 TOKEN DEVELOPMENT AND PRODUCTION

Selecting the correct type of token for pre-payment metering at the time was a problem. Some of them were:

- Re-usable hard magnetic cards.
- Disposable magnetic cards — cardboard.
- Magnetic keys.
- Memory tokens.
- Smart tokens.

Initially tests were carried out with re-usable hard plastic cards. However, the condition of the returned cards indicated to us that we should look at some of the other types. The magnetic key had very low security and at the time we thought the intelligent tokens to be too expensive for this type of application. We thus selected the disposable magnetic card for our application.

Presently, we make use of a low cost, disposable, thin flexi-plastic magnetic card, produced by the South African Transport Services (SATS). The token itself can be seen as the most important part of the complete system due to it being the man-machine interface. If the consumer cannot operate the unit, and struggles with the token, it creates a resistance to the total concept.

Two card security concepts are presently in use:

- AREA coding for specific area or township.
- Individual SECURITY coding for every meter.

AREA coding is handy for small applications where no dispenser/management system is required and cards are preprogrammed by ourselves for a specific area. Sales are recorded manually at the selected points of sale. The major disadvantage is that it is difficult to keep track of individual consumers from a statistical and security point of view. Changing from AREA coding to individual security coding can be done at any stage.

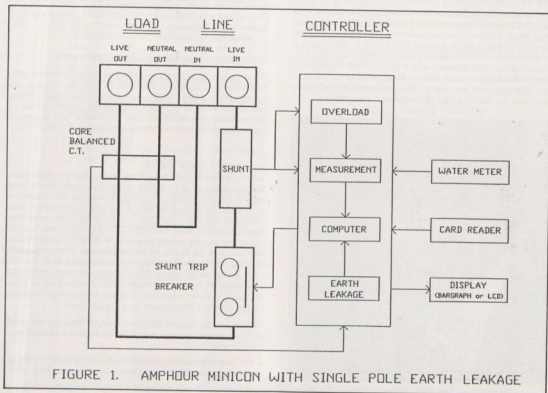
To supply every meter or consumer with individual security codes a dispenser/management system is required. This system is described in more detail later in the paper.

### 4.0 DEVELOPMENT AND PRODUCTION OF THE BUDGET ENERGY CONTROLLER

During the third quarter of 1988, Eskom expressed concern about the prices of pre-payment meters which ranged from R450,00 up to R650,00 per unit. A preliminary enquiry, followed by a formal enquiry, was issued for the development and supply of a low cost unit with an estimated price tag equivalent to that of the conventional system. No specification was supplied, but the following major guide-lines were given as possible cost savers:

- Remaining credit displayed in Bargraph (level) format instead of LCD.
- Incorporating Overcurrent and Earth Leakage protection.
- Relax the accuracy to  $\pm 5\%$ .
- Possibly Amphour instead of kilowatthour metering.

We were at first hesitant about some of the above recommendations but eventually saw it as a new challenge. The period from the time the design phase commenced up to the production phase, was less than three months. (Fig. 1)





This specific unit offers various new features:

- Amhour or kilowatthour metering.
- LCD or Bargraph (level) display.
- Overcurrent protection.
- Earth Leakage protection.
- Top, bottom or rear entry.
- Capacitor or Lithium Battery back-up.
- Tamper switch.
- Water metering.

#### 4.1 AMPHOUR METERING

The Amhour metering circuit takes the variation of the load current into consideration. Voltage and power factor are taken as fixed values. The measurement accuracy over the range is  $\pm 5\%$ .

#### 4.2 KILOWATTHOUR METERING

The kilowatthour metering circuit takes all variables into consideration. The accuracy over the range is  $\pm 2\%$ . This form of metering is approximately 10 percent more expensive than the Amhour metering.

#### 4.3 LIQUID CRYSTAL DISPLAY (Fig. 2)

The LCD offers an 8 digit display indicating the exact amount of credit available to the consumer. It is also possible to obtain totalized information.

#### 4.4 BARGRAPH DISPLAY (Fig. 3)

The Bargraph display indicates the following:

- Whether the consumer has more than 100 units credit. (Green LED).
- Credit in steps of 10 units over the last 100 units. (Red LED's).
- Flashes at 40–31 units remaining. (Yellow LED).
- Also indicates zero credit.

#### 4.5 EARTH LEAKAGE AND OVERCURRENT PROTECTION

At present, the unit utilizes a single pulse trip breaker to control credit and also to trip in case of an earth fault or overcurrent condition. The overcurrent trip point is adjustable over 25 to 30% of the current range selected. The earth leakage trip point is adjustable between 15 and 30mA.

#### 4.6 TAMPER SWITCH

The standard unit is equipped with sealing plugs and lead sealing. As an optional extra a tamper switch is supplied that will either trip the external supply breaker or reset the electronics when the lid is removed or if the complete unit is ripped out of the wall.

Tampering is a controversial subject. One can spend either very little or double the cost of the meter. Our experience over the past two years and 10 000 units produced, has indicated clearly that if a consumer is made responsible for the meter when first installed inside the house, no tampering takes place. However, this could increase in the future, we don't know. The system, including the dispenser/management system, must incorporate some form of monitoring, provided that the cost associated with it is not astronomical.

#### 4.7 TOP, BOTTOM or REAR ENTRY

Depending upon the project requirement, the local authority can specify any of the above forms of entry and exit of wiring.

#### 4.8 WATER METERING (Fig. 4)

The water metering circuitry will accept pulses from a standard pulse type water meter which is available from either Kent or Castle Cobra. We have given preference to a split card system where separate cards are used for electricity and water credit. The pre-payment meter continues to count negative if water is used after running out of credit. Water supply is not interrupted but electricity is disconnected if any of the two credits reach zero. The consumer must first restore both credit registers before the unit returns to normal operation.

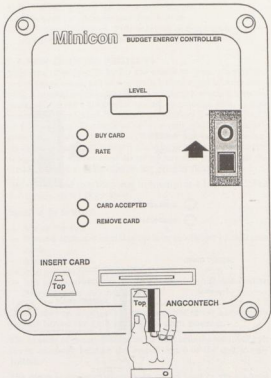


FIGURE 2

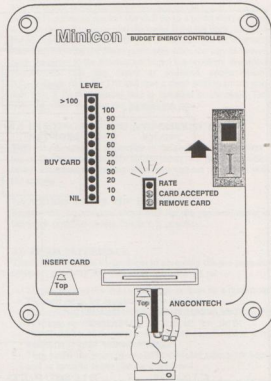


FIGURE 3

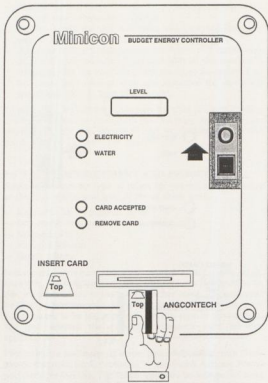


FIGURE 4

### 5.0 CHECKER UNIT

The checker unit was developed to enable to consumer to validate a card at the point of sale. The unit displays the value of the card just purchased, for a few seconds. Units in the case of the first generation meters and monetary value in the case of the second generation are displayed. We have found this unit a vital part of the complete system because it removes the mistrust between the consumer and the clerk who is dispensing or selling cards.

### 6.0 DISPENSING/MANAGEMENT SYSTEM (Fig. 5)

The dispenser/management system was developed during 1988. Improvements and additions are made continuously to the software package. To date, a total of 800 man-hours have gone into the development of the package.

Depending on the type of meters in use, the system performs the following major functions:

- Programming of electricity and/or water cards.
- Testing of cards.
- Update of data base records of all the consumers.
- Printing of transaction records.
- Cash-up reports.
- Monthly financial reports.
- Statistical reports.

When a consumer wants to purchase electricity or water cards, he would identify himself by means of his stand number. Should he be unable to remember his stand number, a search can be done with reference to his surname.

On entering the above, the computer will couple the consumer to his data file residing in the data base on the 40 MByte hard disk, and respond by prompting the consumers address and meter serial number to appear on the screen.

If any account, e.g. rent, is outstanding, the system could prevent him from purchasing any cards for water and/or electricity. The system will display a message on the screen identifying this condition.

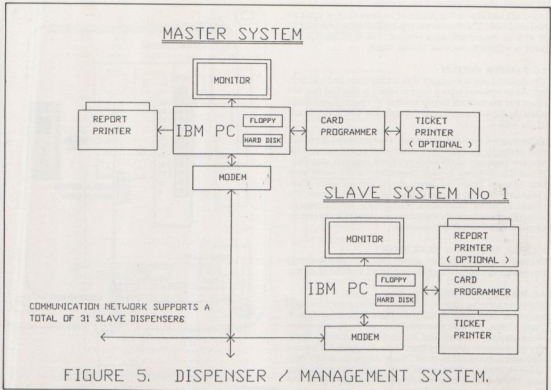


FIGURE 5. DISPENSER / MANAGEMENT SYSTEM.

Cards are available from approximately R1,00 to R100,00 in one rand increments.

The operator will then, from the water or electricity menu on the screen, select the correct size and at the same time will enter the number of the cards requested. A blank card is then inserted into the motorised cardreader/writer. It will take approximately one second to programme a card. The monetary value as well as the amount of corresponding units will be displayed on the screen. The transaction detail can then be printed onto the magnetic card. This can include:

- Time and date.
- Dispenser identification.
- Transaction number.
- Type of payment received.
- Stand number.
- Name and/or address.
- Water or electricity.
- Monetary value.

The above-mentioned information is also optionally transferred to the report printer. The unit value is also added to the list. At the same time the consumer's personal data file is updated.

The following information is stored per consumer and updated, where required, after every transaction.

- Stand number.
- Name and/or address.
- Meter serial number.
- Mini-sub allocation.
- Main feeder identification.
- Installation date — electricity meter.
- Installation date — water meter.
- Last transaction — electricity.
- Last transaction — water.
- Blocking of any purchase.
- Electricity purchased per calendar month over the past 12 months.
- Water purchased per calendar month over the past 12 months.
- Electricity accumulative total.
- Water accumulative total.

Operator functions are limited if compared to the options available to the system manager. In some instances e.g. altering of the price structure requires double security access.

### 6.1 STATISTICAL ANALYSIS

Storing information in the data base is a cost effective method of keeping control of the situation. Some examples of statistical analysis that could be performed are:

- Determining who has not purchased any cards or less than a specific number of units over a certain period.
- Total sales for any period of time.
- Purchases per consumer for any period.
- Recall last transaction detail.
- Average consumption over the past six months.

### 6.2 NETWORKING

The system is designed in such a way to allow the Master computer to communicate with up to 31 slave dispenser systems via auto dial-up telephone modems.

We as yet do not have the experience of such a large dispenser/management network, but our estimate is that a system of this magnitude can serve up to 100 000 consumers.

### 7.0 INSTALLATION RECOMMENDATIONS

Location and installation method of the pre-payment meter is broken down into the following categories:

- New housing project.
- Existing housing project but new electrification project.
- Existing housing and distribution network with the conventional meters external to the house.
- Existing housing and distribution network with the conventional meters located in the house.

Other factors playing an important role are:

- Overhead or underground distribution.
- No external breakers, Pole breakers or breakers located in stubbies or street kiosks.

### 7.1 NEW HOUSING PROJECTS

This type of project is by far the easiest to start off with the pre-payment concept. The concept is incorporated into the planning. The ideal location for the unit is definitely inside the house, preferably in the kitchen and against an external wall. A pipe could be incorporated into this wall, whether from the bottom or from the top. The cable or aerial supply wires can be terminated in a square round flush mounted box behind the pre-payment meter or otherwise it could be brought into the meter from the rear via the flush mounted box and terminate at the terminal block supplied inside the pre-payment meter.

We recommend that the meter is installed at a height of 1.5 to 1.7 meters above floor level.

Spots to be avoided:

- Above the sink.
- Where a cupboard or fridge could be positioned by the home owner.
- Above the stove.
- In a passage.
- In a position where it can be damaged by the distribution board door or any other door.

One of the best locations we have seen, the meter was actually located behind the back door in an open position.

The bottom of the enclosure can be built into the wall, but this is not necessary because the overall depth of the unit is only 100mm.

The meter is mounted using three round head or cheese head screws. Caution should be applied in the type of plugs used when mounting the meter against a wall built of cement blocks with cavities.

### 7.2 EXISTING HOUSING - NEW ELECTRIFICATION

The wiring or cable should be brought to the meter via a pipe externally mounted against the wall up to a point where it goes through the wall to enter into the meter from the back. Depending on the type of houses, the pipe or conduit can be internally mounted, entering the meter preferably from the top. However, from the meter to the distribution board is a problem. We would recommend that the meter is installed approximately 200 - 300mm from the DB and that a short section of the conduit plus a flush mounted box is installed in the wall. This however, does increase the installation cost.

### 7.3 EXISTING HOUSING AND DISTRIBUTION NETWORK

The recommendations are similar to the above. Beware of bridging in the incoming supply to the meter via the distribution board. This makes bridging quite easy without tampering with the meter.

### 7.4 METERS INSIDE THE HOUSE

Replace the conventional meter with the pre-payment meter in the same position unless this is not practical.

### 8.0 FIELD EXPERIENCE

The consumers have no problem in accepting the pre-payment concept, provided the following are adhered to:

- The displays to the consumer must be kept to a minimum.
- The unit must be installed inside the house.
- The point of sale must be within walking distance from the dwellings served by it.
- The operation of the total system must be explained to them individually after commissioning.
- They prefer the point of sale to be open for sales after hours and at specific times during a weekend.

At this stage, we have not gained enough experience on the electricity-water combination. This unit might be difficult to

understand fully in very low cost housing applications. However, we will compile a report on field experience as soon as possible.

We can accept that electronically based devices will have a higher failure rate than the conventional meter. It is our objective to analyse field failures or problems immediately where possible and to rectify the design accordingly.

Some of the major problems we have experienced over the past two years are:

- Badly programmed cards owing to the varying magnetic density on the cards.
- Low frequency interference noise causing the pulse trip breaker to trip sporadically. We have implemented additional filtering into the Earth Leakage detection circuitry of the Amphour unit. The kWhr unit incorporates completely new Earth Leakage detection circuitry.
- Failure of the pulse trip breakers. We have altered the software operation of this device.
- Transformer failures. The design was improved accordingly.
- Leaking capacitors, causing the standby Lithium batteries to drain. The ceramic capacitor was replaced with a high quality tantalum capacitor.

In the factory itself, 10 percent of the personnel are involved in quality control. Reliability will improve drastically once new technology is implemented in the next 6 to 9 months.

Furthermore, we have found the incorporation of protection into the pre-payment concept to be a controversial matter. Many local authorities see this as an unnecessary burden on their maintenance personnel, whereas others saw it as a part of the educational programme. When they are called out to investigate a trip and find the problem to be due to faulty appliances etc., the consumers are billed for their time.

#### 9.0 THE FUTURE OF PREPAYMENT METERING

The future of prepayment metering in South Africa depends on the following:

- Improved reliability.
- Co-operation between the suppliers and the manufacturers.
- Co-operation between the local authorities and the manufacturers.
- Proper marketing down to consumer level.
- Improved relations between the local authorities and the consumers.

New technology continuously opens new doors to the manufacturer. It is however our task to ensure that proper back-up is supplied over the coming years and to ensure that all new developments are compatible with older (generation) systems.

Presently, we produce between 1200 and 1500 units per month. Should it be required, modern assembly techniques could be implemented to increase the production rate to any amount above 2000 units per month.

#### MR D.E. VELDSMAN — DEPUTY CHIEF ENGINEER, CAPE PROVINCIAL ADMINISTRATION

I would like to congratulate Mr Coetsee on a well prepared paper which covered a subject that is of interest to most of us.

Mr Coetsee outlined the problems that they as manufacturers have experienced. I would like to raise a few matters from a Supply Authority's point of view and perhaps help to guide prospective users of budget meters around some pitfalls which they may experience on their route.

#### EXPERIENCE TO DATE

At present there are approximately 620 budget meter consumers in Khayelitsha and this figure is expected to increase to about 4 500 within the next 12 months. Most of these matters have been installed in private developments, but a project which covers the installation of about 600 meters in existing dwellings and which is financed by the Western Cape Regional Services Council, is currently under construction.

We are running two separate budget meter systems at present. The second system was introduced because of a cost factor.

Some specific issues relating to meter systems will now be discussed.

#### METER INSTALLATION

Detailed sketches should be prepared for the employee or contractor who is to install the meters. Incoming cables should lead directly into and be terminated at the back of the meter without any intermediate connections on the outside wall. This is done to minimise the possibility of tapping into the supply cable.

It is important at the outset to make it clear that tampering with the meter will lead to severe penalties and possibly a permanent termination of supply. Labels to this effect should accompany the meters and the regulations should be rigidly adhered to, otherwise the system will degenerate, leaving an expensive mess.

#### MARKETING AND EDUCATION

New meters are being installed predominantly in the developing sector (viz. low income urban communities) where the use of both electricity and budget metering is often foreign. Therefore it is important that a budget metering project, and indeed any electrification project in such communities, be backed up by marketing and education programmes. These can take various forms but should be executed hand in hand with the technical work in order to promote good use and satisfaction with the product.

#### WHAT SHOULD A SUPPLY AUTHORITY LOOK FOR IN A BUDGET METER SYSTEM?

##### 1. The Meter

The most important factor concerns the specifications of the meters themselves and especially whether the meters meet their specifications in practice. Many undertakings want to opt for budget meters, which entail a higher capital cost than conventional metering, while the industry is still in its infancy stage. Therefore reliability is a crucial issue at this stage.

Closely linked to reliability is service from the manufacturers. In the event of meters malfunctioning, the supply authority merely replaces them while the manufacturer must repair them. Close attention and rectification of the problem is essential.

Problems in the field have included mainly card reading problems.

Features which have proved to be useful in the field are:

- (a) emergency credit/low credit warning
- (b) a "tamper proof" mechanism which short circuits the external supply and/or switches off the internal supply
- (c) no memory loss through power failure
- (d) indication of rate of use (flashing LED)
- (e) digital display



Mr D Veldsman

System Description	Characterised by
<ol style="list-style-type: none"> <li>no central dispenser area codes cards sold from eg. shops for small customer base</li> <li>stand alone dispenser distinct meter codes</li> <li>system of interlinked dispensers</li> </ol>	<p>convenience for consumer little control &amp; monitoring possible manual recording of transactions</p> <p>high security one sales point</p> <p>large sophisticated system consumers can buy at any dispenser</p>

A feature which has previously been specified but which is not recommended is an integral earth-leakage/credit trip in the meter. This causes electricians to be called out for faults which are not meter faults.

Further improvements should include:

- improved physical security
- modular design to reduce damage during installation

## 2. The Dispensing/Management System

This is the hub of the system through which money is collected and control is kept. There is a whole range of possibilities as shown in the table above.

The most common system would be number 2 above; usually PC based. Criteria which are important are:

- ease of use for operator
- flexibility and variety of functions eg.:
  - being able to access the consumer database in a variety of ways
  - checking on consumers who haven't been buying lately
  - checking sales in a particular area against minibus output
  - possibly having a customised tariff structure
  - producing statistics for internal use as well as annual report to Dept. of Statistics
  - satisfying the accountants
- security against forgery
- security against internal abuse
- bug free software!

## SOME STATISTICS OF SYSTEMS IN USE

The attached graphs show some statistical distributions taken from the system in use. The graphs represent a range of consumers from low income to middle income.

Figure 1 and 2 attached show the Rand amounts of transactions. The transactions are grouped in R5 steps and it is apparent that R10 and R20 are the most common amount for both systems. The number of purchases not in multiples of R5 is insignificant.

Figure 3 shows the time in between purchases, illustrating that by far the majority buy twice weekly or less.

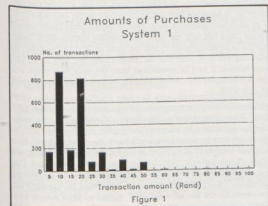
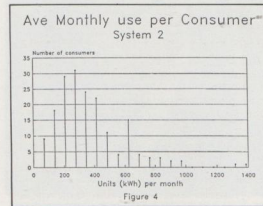
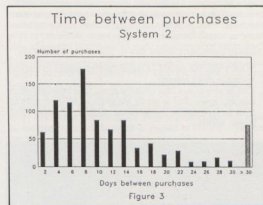
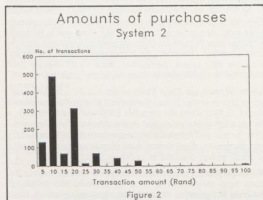


Figure 4 shows the average monthly use per consumer based on the average daily use. The period under consideration is May - September. The consumption per household is relatively low because only about half of the consumers have geysers and stoves.



## SUMMARY OF STATISTICS

Figure 1: 75% buy in R20 or less  
average is R18

Figure 2: 85% buy in R20 or less  
average is R17

Figure 3: 74% buy twice-weekly or less  
50% about once a week (< 8 days)  
average time between purchases = about 10 days

Figure 4: Average daily consumption = R1,33  
=> Average monthly consumption = R40,50  
=> Average monthly consumption = 369 kWh  
74% use less than R1,50 per day => 416  
units/month

## MR R R GILMOUR: CAPE TOWN

We obviously have advanced considerably in prepayment metering since these meters were first introduced about 90 years ago. In the first edition of his book on electricity meters dated March 1906, Mr C H W Gerhardt then stated "of late years the prepayment meter has come very much to the front and is generally speaking a much more complicated piece of apparatus than the ordinary meter". However, the cost of maintenance, testing and problems with spares, particularly when tariff changes took place, led to the decline in their use many years ago.

About 50 years ago Cape Town re-introduced a limited quantity of coin operated meters for use in a group of sub-economic blocks of flats when the price per kWh was one halfpenny, a far cry from today's charges. Again the spares problem arose after the war and coupled with tampering and cockroach entry into the meters, these meters were abandoned again in favour of credit meters installed in common meter positions.

With regard to the system described by Mr Coetzee interest has again been shown in this form of payment for electricity. However the problem of tampering, by-passing, etc. is likely to be something we will have to live with for a long time yet in spite of by-laws which make the consumer responsible for the meter. It does seem ironic that where consumption and therefore revenue are generally small, authorities appear to be expected to install the most expensive meter available.

The only questions I would like to put to Mr Coetzee are:

1. What about the calibre of meter testers required to test and maintain these meters?
2. Can he give us any idea what the mean time between failure rate and mean time to repair are likely to be? This appears to be an accepted basis of assessing reliability of modern electronic devices.



Mr G Gilmour

3. Has he any views on dispensing with meters in low-income/sub-economic situations and relying on load limiting devices e.g. miniature circuit breakers and levying a fixed charge for electricity as has been proposed by others in the past?

## MR HOWARD WHITEHEAD: DURBAN

Mr President, the points I would like to raise is we're offering or proposing to offer this meter as an alternative to our present way of metering electricity which is somewhat negative in its context when it comes to recovering money and that we have to disconnect it and penalise a person but we are in the business of selling electricity and that is rather a negative approach. I think we all perceived this meter as being a better means of collecting money and as such then it automatically becomes a counter to theft. I agree with the speaker from Eskom that it should not be perceived as such but I believe and would hope that it is going to be a tool with which we can in fact improve our financial recovery amongst the lower income groups and in that respect of course we again do not want it to become a device as seen for the lower income groups but an option which anyone can have should they so desire. And as such then, Mr Coetzee sort of skipped over the issue of installation but I would like to have some comment from him on retrofitting such a meter in the place of Ferraris disc meter which is usually on the outside of the building and what costs could be incurred in fact in getting the mains services through to the inside of the house where these meters should be fitted. I would also like comment from either Mr Coetzee or anyone who has put these meters to use as to whether in fact they have had any evidence of there being a real reduction in theft.

## MNR J A LOUBSER: BENONI

Mnr Veldsman het nou iets gesê wat my verskriklik bekommer. U weet, die gewone outydse elektriese energiemeter wat ons ken is 'n uiters betroubare instrument en as ons van hulle moet ruil per jaar is dit baie minimaal. Mnr Veldsman het gesê ons moet reëlings tref om die meter maklik te kan ommuil. Nou maak ek 'n bewering, as dit die geval is dan is hierdie tipe meter nog nie betroubaar genoeg vir algemene gebruik nie.

## RDL FRIKKIE KOTZE: PORT ELIZABETH

In die saak wat mnr Coetzee aangeraak het in verband met die watermeters alhoewel hy gestel het dat dit 'n duur storie is soos ek dit nou afgelei het. As ek sien wat in die jongste tyd besig is om te gebeur in ons omgewing met die ontwikkeling van ons sogenaamde swart gebiede waar watermeters, koste ± R200, tot 50 per nag uitgehaal word om verkoop te word. Ja, dames en here, Meneer die President, dit is iets om oor te lag maar ek is 'n leek op die vlak van elektrisiteit. Die feit bly staan dat ons baie geelkoper en koper in Suid-Afrika het, die skroothandelaars moet ook lewe en hulle ry in vliegtuie. Daarom raak ek dit vanoggend aan dat hoe meer ons u maatskappij in die saak kan help dat hierdie watermeter wat op die huidige oomblik omhul is met geelkoper wat 'n fantastiese herverkoopprys het, in samewerking met die WNNR in totale plastiese omhulsels kan omgesit word. Dit het nou al reeds die plastiese en bakeliet bestanddele binne in die meter. Meneer die President, dan dink ek doen ons 'n diens vir Suid-Afrika. U weet, dat ons water as 'n kommoditeit die goedkoopste in die hele wêreld is. U en ek betaal daarvoor want hierdie sogenaamde derde wêreld mense hulle het nog nie besef wat daardie kommoditeit Suid-Afrika se belastingbetalers kos nie. And on account of that I'm pleading for it so that this be installed in time now in all the new houses, it can be connected later on, at a later stage but the fact remains that, think about it, lets plan and place it now to save cost.

Meneer die President, jammer dat ek nou 'n "tongue lashing" doen. Here you've got a beautiful pamphlet in English, referaat, in Afrikaans en meneer Coetzee het melding gemaak dat hier min van ons swart mense is. May I plead through you that all these beautiful pamphlets in the future, wherever there are black people present, that their mother tongue be printed. I'm appealing for this on account of being a member of a Regional Services Council where they don't always read the agendas but they look at the pictures, Sir. My appeal to Mr Coetzee who wants to make money of a proposed good product, thank you.

## **MNR ATTIE VAN DEN BERG: KRUGERSDORP**

Mnr die President, Eskom het die VME0 versoek om mee te werk met die opstel van 'n spesifikasie vir bogenoemde meters wat koste-effektief moet wees.

Sedertdien het die SABS die VME0 versoek om verteenwoordigers te nomineer om 'n SABS Spesifikasie daar te stel waaraan voldoen moet word deur alle vervaardigers.

Deur so 'n Spesifikasie af te dwing kan voldoen word aan basiese vereistes soos akkuraatheid, ens.

Mnr Schoeman van Pretoria en Whitehead van Durban dien op die SABS Komitee vir die opstel van die Standaard Spesifikasie, Projek Nr. 754/50500.

## **MR J G MALAN: KEMPTON PARK**

Mr President, I have a few comments on the concept of prepayment meters and then I would ask a question.

1. Contrary to most forms of energy, electricity is consumed first and then paid for — prepaid meters bring this anomaly in line with other forms of energy sales.
2. To my mind, the prepaid principle has two basic objectives, namely
  - (a) it must save manpower
  - (b) it must obviate bad debts.

As far as manpower savings are concerned we know that we are reaching our objective in that we do not need meter readers anymore, we do not have clumsy meter books, we do not process accounts, we do not have to post those thousands of accounts every month, we do not handle any frustrated customers due to incorrect or perceived incorrect accounts, we do not have peak periods with long queues in the rates hall anymore, we do not have to cut supplies due to non-payment and we do not have to handle the numerous arguments which result from such actions, and so we can carry on with the long list of advantages of the prepaid concept.

The second objective, namely obviating bad debts is as important as the first one. We can only obviate bad debts if the system is fool proof and in my opinion the system can only be fool proof if at no stage the supplier loses touch with the meter. If the meter can be bridged by whatever means, even by a T-joint on the service connection cable in the garden for example, then surely the object is defeated and by the time the supplier gets wise he is faced with an irrecoverable loss on units consumed as well as the inspan of manpower to investigate and to correct the problem.

In certain underdeveloped areas any meter is tampered with if power consumption is to be paid for, even without touching the meter, and it is in the supplier's interest to correct such tampering as soon as possible.

Mnr die President, my vraag is:

Hoe oorkom of hanteer mnr Coetzee hierdie moontlike vorm van peuterling?

## **MR PETER B POWER: AFFILIATE**

Mr Coetzee has very understandably focused on the advantages of pre-payment meters, and given us a very valuable survey of the "state of the art" and the facilities which can be provided through them to help the electricity undertaking. I would like to share a few thoughts on the application of these most interesting new meters.

### **I. THE SUPPLY UNDERTAKING**

From the Undertaking's point of view, the total pre-payment meter system is expensive, but in his paper Mr Coetzee claims many advantages for the system. He lists firstly, the avoidance of bad debts, debt collection costs, and the existence of unrealistically large numbers of disconnections and reconnections. He quotes some horrifying figures.

In fact, however, these factors should not be regarded by the Undertaking as reasons for the introduction of pre-payment meters, since they should be addressed in other ways.

To begin with, and most importantly, it is essential that we have

a good approach in our relations with our consumers, so that we are perceived by them as being "good guys". I believe that it would be a mistake to, for instance, couple the non-payment of rental with electricity service disconnection, as suggested by Mr Coetzee. The landlord function is a separate issue, and should not be allowed to be-devil the Undertaking's relations with its consumers.

Once consumer relations are on a good footing, non-payment of accounts, (and the resulting debt collection costs and bad debts), can then be largely eliminated by unrelenting discipline on the part of *management* in:

- early reaction to non payment of an account;
- consistent effective action taken against non-payers.

This approach by the Venda Electricity Corporation has reduced bad debts to 0,05% and debt collection to 0,2% of sales; disconnections and re-connections are under 0,3%. Compare this with the figures of up to 80% bad debts and 10% disconnections/reconnections given by Mr Coetzee.

The adoption of pre-payment meters to solve these problems simply does not address the root causes, and a disciplined management approach on the lines mentioned above may well be the most cost-effective solution.

The other savings and advantages conferred by pre-payment meters, namely:

- Meter reading cost reduction;
- Reduction of fraud;
- Improved data capture and processing;
- Payment for consumption in advance.

are real, and need to be evaluated in testing the probable viability of the meter system.

### **2. THE CONSUMER**

Several advantages to the consumer are perceived by Mr Coetzee, but it is by no means certain that the pre-payment concept will be universally attractive, especially to more sophisticated consumers used to running charge accounts or credit cards. Such consumers would need to see some cash incentive for money paid out up-front, and the inconvenience of always having to plan adequately in advance to avoid running out of meter credit.

This immediately introduces a problem in undertakings which adopt a monthly two-part or block tariff for domestic consumption, since prepayment will not normally relate to any specific period. If the prepayment tariff is set at a level above the incremental kWh rate, it will penalise those consumers who use more electricity, nominally the more sophisticated who would be looking for some discount in respect of their pre-payment for the service.

Staying with the consumer, it seems clear that if the system is to be in any way credible, it must have a very high degree of reliability, and a very responsive back up service.

Nothing can be guaranteed to be more conducive to bad will, than that a consumer, having bought a card, finds that on getting home, it does not provide him with the electricity he has purchased, and that he cannot get the matter rectified *immediately*.

The matter of pre-payment tariffs is a subject in itself. Possibly the best approach would be to offer pre-payment as an alternative tariff form. Most importantly, the pre-payment concept should not, in the interests of good consumer relations, be viewed by the undertaking as a means of disciplining poor payers.

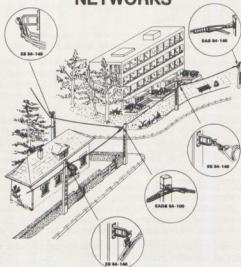
Lastly, although Mr Coetzee has made the point, it bears repeating that imaginative marketing and consumer education, are essentials to the successful introduction of this system.

## **MNR J VAN DER MERWE: ESKOM**

Rudy, ek wil jou baie gelukkings met die werk en die moete wat julle gedoen het, die waagmoed wat julle aan die dag gelê het met die ontwikkeling van 'n nuwe tegnologie. Ek dink so ver dit die hoogs tegnologiese stuk toerusting aangaan, staan ons vandag met die nuwe elektrisiteitsmeter waar ons sê maar,

# SIMEL — MALICO

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twintig jaar gelede gestaan het met 'n sakrekenaar en vandag is dit iets alledaags en niks meer nuut nie. Die nuwe tegnologie het iets moontlik gemaak wat in die verlede nie moontlik was nie. Hy bring sekere voordele wat ons nie kon smaak met ons ou tegnologie nie. Ek dink die kwessie dat jy geld in die ou meter gesit het, soos mnr Ronnie Gilmore gepraat het, was daar 'n groot sekuriteitsprobleem en dat die plastiek geld nou baie veld wen. Ek wil graag vir Deon Veldsman ondersteun wat hy sê in verband met die bemaking van die stelsel. Een ding moet ons baie goed onthou, ons het grootgeword met elektrisiteit, dit is deel van ons lewe, dis deel van ons sosiale kultuur. Ons probeer dit nou beskikbaar stel aan mense wat nog nie die opvoeding en kundigheid het nie. Die voorafbetaalde meters moet nooit beskou word as 'n oplossing vir mense wat nie hulle rekenings betaal nie. Dit moet 'n tariefopsie wees. As ons die stigma daaraan koppel dat as 'n man nie sy rekening betaal nie en jy sit vir hom 'n voorafbetaalde meter in dan gaan ons een van die top tegnologiese vooruitstaptes wat gemaak is in meting verloor omdat ons die saak verkeerd hanteer. Dit is 'n tariefopsie, dit is 'n saak van die toekoms! Baie dankie.

#### MR E G DAVIES: PIETERMARITZBURG

Mr Power has made a point that we — the electricity undertakings need to be looked on as the good guys — this is of cardinal importance.

"The paper on page 8 contains the following: - If any account e.g. rent, is outstanding the system could prevent him from purchasing any cards for water and/or electricity" — this should be rejected out of hand. To adopt such a system would lead to a very unfavourable reaction. Already the City Treasurer disconnects the electricity supply to recover such things as charges for refuse removal and other sundry unpaid accounts. This practice leads to the Electricity Undertaking being considered the "Bad Guys" and should be discontinued.

It is the responsibility of the City Treasurer to collect such accounts without or use of the electricity supply for punitive measures.

I would oppose most strenuously any budget metering being introduced which could be considered punitive. It simply will not work.

At present we have a system of metering and account payment which has served us well in the past but is now leading to theft of electricity of about 30 % in certain areas. Should we not be looking at the existing system to improve it before embarking on the installation of budget metering which would cost ± R400 000 for 800 meters and which will in any case prevent tapping off before the meter which even at present is the main method of theft of electricity.

At present some systems provide for only one payment point possibly up to 10 km from where the electricity is used and at times which are impracticable for the consumer — this needs urgent attention. Furthermore some undertakings invoke a punitive reconnection charge — which I believe only compounds the problem — we are in the business of supplying electricity not collecting money by cutting consumers off.

#### MR RUDI COETZEE: AFFILIATE

Just on the mean time between failure there has a lot been said about reliability. Once again, possibly we stand at present where the car was eighty years ago and they still have problems. We do not say we are going to get rid of all our problems. What we are saying, with modern technology, however, is we could not afford modern technology right from the word go because we did not know whether it was going to take off. Developing hybrids and so on is quite expensive. That is where you put a lot of small electronic components into one single unit and this is the road of the future to increase reliability. I think we will still see problem areas or problems between ½% and 1% in the future but the main problem is really during the commissioning phase with these electronic devices and a lot of that is because of a lack of knowledge from the installation, the local authority and the consumer side. Fifty percent of the meters returned to us, and that's about 6-7% at this stage, have no problem with it whatsoever. So we are actually talking of a real



figure and if that training was done properly, of about 3-4% presently. Next year we hope to achieve between 1% and 2% and possibly the year after that lower than that. So we are not talking about a horrendous figure. I think there are some of the other suppliers who have a far more severe problem than we have at the present moment. Just the flat rate device itself, in our investigation, it was found that the flat rate device — blacks just don't go for it, I'm sorry. They do not fall for that anymore for water metering as well as electricity. Coming on to Karen Wiid, just a quick reply. When a meter is faulty, fortunately our meters do not go faulty at a high rate, but what we do is, in our dispenser, we try to keep the system as simple as possible. So what we actually do is, in our dispenser system itself we record the last transaction, the date, the time, the transaction number and we also keep a record of the exact average and what we then do is, should a meter fail, actually issue him credit from the last transaction date in the form of averages. Bridging itself. We have seen a couple of cases when you get closer to the city eg Alexandria. In Khayelitsha itself they just had one case now, out of about 300 installed meters, of bridging out the meter and this is purely that they saw how the electrician did it and they did it themselves but that specific meter did not have a tampering device in it and since then they have introduced the labelling which I think is very important. Alexandra and Johannesburg has done the same just their penalty is much higher than in Khayelitsha. But with the tamper switch we found it is quite effective, they are very scared to actually pull on that meter whether its the lid or pull the whole meter off the wall. At this stage I do not want to comment too much on the different concepts of reporting back to a central system. All we know is that in Europe systems exist with telemetry systems, telephone lines, etc. but none of these has been in favour so far because of the complexity and the failure rates on these complex methods of reporting. One day maybe a system will be developed, we are not against it, we just say it is not economical at this stage for ourselves.

Meneer Boshoff die battery-konsep self. Ons moet net een ding hier verstaan. Dit hang af water battery mense natuurlik gebruik. Die lithium battery het 'n leeftydperk van tussen 20 en 30 jaar. As 'n mens kyk na "preventative maintenance", soos hulle dit in Engels noem dan kan jy natuurlik net na 20 jaar die batterye vervang. Daar is natuurlik die moontlikheid van 'n "square prom" soos wat hulle die tipe geheue noem maar weer eens is jy beperk tot die hoeveelheid lees en skryf tipe siklusse wat jy kan doen en dit beperk ook maar jou leeftyd tot ongeveer twintig jaar. So ek sal se met die leeftydperk praat ons in die omgewing van twintig jaar en dan moet daar iets gedoen word. Ons weet nie, miskien kom hy iets binnekort op die mark wat ons sal help.

Raadslid Kotze ek is baie bly oor die punte wat u noem veral wat watermeting betref. As ek net vinnig iets oor die watermeting kan se. Eerstens om dit in die elektronika by te voeg in ons spesifieke geval en ek kan net praat van ons, dan praat ons van R15. Baie mense sit nou al die water/elektrisiteit kombinasies in by die begin, en voeg dan later die watermeter by in die veld. Nou die watermeter self. Ons het onderhandel met Castle Cobra, hulle het ook nou een ontwikkel maar die projekte waarmee ons betrokke is, is Ray Kent self d.w.s. die Kent tipe watermeter. Ek dink dit hang af van hoeveelheid maar dit wissel tussen R70-R120 afhanging van die hoeveelheid van die tipe watermeter met 'n 15 m sensorkabel. Die kabel self. Sou hy die kabel breek of in die meter verwyder dan sal hy die krag outomaties afskop in die huis. Dit is so ver wat ons self gegaan het. Mens kan natuurlik ook die krag by die paal laat uitklop. In hierdie stadium probeer ons nog steeds 'n gevoel kry van die mark. Ek dink ons moet eers die konsep en die betroubaarheid van die meter aan die gang kry voordat ons te kompleks begin raak. Wat ek bedoel met kompleksiteit is nou bv. die meter flikker tussen elektrisiteitkrediet en waterkrediet elke tien sekondes en as dit hulle nie deurmekaar maak nie dan sal dinge goed gaan. Wat die pamflet aanbetref. Ons het pamflette in Xhosa omdat ons betrokke was daartye maar die terugvoering is, dat as die pamflet in Xhosa is dan het jy 'n meter spesiaal vir hulle ontwerp omdat hulle boewe is. Dit is 'n baie snaakse vertrouenskonep wat bestaan, veral onder die swarte. Die kleuring het 'n "no problem" situasie maar die swarte

vertrou niks nie en hy verkies Engels of Afrikaans op sy meter. Dit het ook so in Khayelitsha uitgekóm.

Vir mnr Jannie van der Merwe van Eskom, wil ek net noem, dat ons darem by blanke projekte ook betrokke is en daar geen rede bestaan hoekom blanke dit nie kan kry nie.

Aan mnr Algeria: ek wens ook ons kon beter saamwerk. Miskien kan die Staat wel 'n rol daar speel, nie in die vorm van 'n spesifikasie nie, maar in 'n tegniese rol, waar ons dalk gesamentlik 'n eenvormige netwerk ontwikkel wat deur almal gebruik word. Die tipe eenvormigheid. Ek dink nie ons het in Europa stelsels wat nie dieselfde lyk of werk nie. Dit gaan 'n probleem wees. Terugvoering met peuterling het ek reeds bespreek. Foutvlak — ons voldoen aan die Eskom spesifikasie wat deur die Staat aangeva is en waar die SABS en die VME0 ook betrokke is. Ek weet hierdie groep mense het laas in April vergader en dis hoog tyd dat hulle weer 'n slag bymekaar kom. Wat die indikasie aanbetref wil ek dit baie duidelik vir mnr Algeria stel dat die damvlakkonsep maar een voorbeeld is en dit is maar net 'n lae koste voorbeeld: Jy spaar omtrent R25. Dis maar al uit 'n kapitale oopkoop maar dit is nie 'n persentasie nie. Ons spesifieke eenheid en dan natuurlik die LCD is in eenhede wat net tot 99 000 krediet kan gaan.

Mr Ron Leigh, Johannesburg. I very much agree with you regarding the simplicity of the meter and getting the prices down. We presently stand at a basic concept of about R330 to a maximum of about R430. The maximum I am talking of is the water/electricity combination, tamper switch, kW hour, LCD display, you name it, the whole lot. Then on the amp/hour meter itself, I agree with you that it is a very simpler form of measurement, it's actually the correct method of measurement because you size your cables and your overhead wires accordingly and this is where the money really goes and amp/hour is really the answer. I mean, what is the current in the cable? That is the most important factor and why benefit the customer if he operates at a low power factor, which is the biggest stupidity I have ever seen. Then as I say we are not only using it in black towns, we have white towns as well. I think the reason why it is mainly going into black towns at the present is because these are the new areas being electrified. Progress on the card reader reliability. We have done a lot of research on that. We are looking at the intelligent form of tokens for the future but maybe that will only be available in about a year to two years time. There will be a lot of investigation before that. But on the cards itself we have done well, we are still improving continuously and I think things can only get better on that aspect.

Mr Whitehead, Durban. Yes it is true to say that these meters should not go into the houses where you have a bad debt. The only place that I know that is following that route, and they can correct me if I'm wrong, is Umata but they do not seem to have a problem with it out there. Moving the meter or if the conventional meter has been on the outside to the inside. A lot of places have just taken the mains through the wall and put the meter on the outside and then chased or put a conduit to the DB board itself. There is an additional cost and you are possibly talking of about R50 per meter. A lot of meters, I must mention, have been operating for two years on the outside of the houses in steel boxes where the boxes are sometimes left open and to our surprise they have not given that amount of problems even though they are electronic devices.

Mnr Loubser van Benoni, betroubaarheid. Ek dink my standpunt is nog steeds dat ons nie miljoene rande kan spaander om hoogs betroubare meters te ontwikkel as ons nie u ondersteuning kry nie. As ons almal se ondersteuning kry is dit 'n ander storie en dit is die roete wat ons nou volg en dan praat ons byvoorbeeld van 48 komponente in een enkele stroombaan. Mr Peter Powers this is exactly the same answer to your question of reliability. Wat die Komitee aanbetref is dit met vuur en vlam begin, ek sal graag wil sien dat dit met vuur en vlam aangaan. Dit is weer eens een van daardie komitees wat reeds vier keer verander het en een keer per jaar bymekaar kom en dan nie weer nie. Ek dink dis baie belangrik dat die praktiese aspekte en ondervinding opgevolg word deur die komitee. Baie dankie meneer.

deur P.J. Botes  
**Stadselektrotegniese en Meganiese Ingenieur**  
**Stadsraad van Roodepoort**

**MNR FLU DANIEL: PRESIDENT**

Mnr Piet Botes het sy BSc graad in Elektroniese Ingenieurswese aan die Universiteit van Stellenbosch verwerf, is in besit van die Sertifikaat van Bevoegdheid vir Elektriese sowel as Meganiese Ingenieurswese en is geregistreer as 'n geregistreerde professionele ingenieur. Mnr Botes is ook 'n genoot van die SA Instituut van Elektriese Ingenieurs sedert Oktober 1970.

Piet het vir 'n paar jaar by EVKOM gewerk en daarna was hy tegniese ingenieur by die Johannesburgse Stadsraad in die elektrisiteitsdepartement. Daarna is hy by die Stadsraad van Roodepoort as Assistent Stadselektrotegniese Ingenieur sedert Oktober 1956 aangestel en bevorder tot Stadselektrotegniese Ingenieur in Augustus 1961.

In 1969 is hy bevorder tot Stadselektrotegniese en Meganiese Ingenieur. Piet is 'n Vrystater van geboorte en het ook sy hoërskoolopleiding in die dorp Vrede in die Vrystaat ondergaan. Hy is getroud met Urtney en hulle het 4 kinders.

Piet is natuurlik 'n ou bekende in die VME0 en was President van ons vereniging vanaf Februarie 1979 tot Mei 1981 en dien tans nog op die Uitvoerende Raad van ons vereniging.

Mnr Botes is ook lid van die Elektrisiteitsraad van Eskom waarop ons as VME0 baie trots is.

Dames en Here ek vra nou vir mnr Piet Botes om sy Referaat onder die opskrif VME0 Elektrisiteitsondernemings Quo Vadis, aan te bied.

**MNR P J BOTES: ROODEPOORT**

Meneer die President, Dames en Here,

Dit is vir my 'n besondere eer om hierdie referaat te lewer. Ek is nie van voorneme om my referaat te lees nie en wens om eerder op sekere stellings uit te brei en bykomende inligting te verskaf. Ook het ek nie gepoog om tegnologiese aspekte aan te raak nie, want ek ontstaan met die feit dat die tegnologie na homself sal omsien en aanpas volgens omstandighede.

Dit was vir my ook 'n groot voorreg om as afgevaardigde van die VME0 die Wêreldkragbron Kongres in Montreal by te woon en deur die ondersteuning van my Stadsraad het ek die geleentheid gebruik om 'n besoek te bring aan American Electric Power in Columbus Ohio, Southern California Edison Company in Los Angeles en die Electric Power Research Institute in Palo Alto. Die kennis wat ek op hierdie toer opgedoen het, sluit by hierdie referaat aan.

As gevolg van die energiekrisis wat in die sewentiger-jare ontstaan het en die gevolg daarvan op die elektrisiteitsvoorsieningsgebied, waar 'n daling in energieverbruik skielik 'n oorskot opwekkingsvermoë veroorsaak het, terwyl bykomende kragstasies wat bestel was in die tyd toe daar nog 'n sterk groeikoers was, hierdie toestand vererger het. Die kragstasies moes betaal word en die verminderde elektrisiteitsverkoep moes hiervoor betaal, gevolglik het die prys van elektrisiteit gestyg. Op die korttermyn sekerlik tot en met die jaar 2000, soos dit die geval in die Republiek is, is dit finansiële uiters gewens om meer elektrisiteits energieverkoep te verkry om die prys van elektrisiteit laag te hou. Dit wil dus voorkom, finansiële gesproke, dat daar op hierdie tydstep geen noodsaaklikheid bestaan om prosesse en bemarkingsaksies in te stel met die doel om die publiek aan te spoor om te bespaar nie. Op die munisipale vlak waar die klem op die bydrae van elektrisiteit val, is hierdie gedagte om die publiek aan te spoor om energie te bespaar teenstrydig en onverstaanbaar.

However, due to normal ongoing growth, towards the year 2000

additional generating capacity will have to be created and therefore new power stations must be built against environmental concerns such as "acid rain, the hole in the ozone layer, the greenhouse effect and nuclear radioactivity".

In his keynote address at the recent World Energy Conference held in Montreal, Canada, on the theme of Energy and Society, Lord Marshall of Goring (Chairman of Britain's Central Electricity Generating Board), (CEGB), you will recall that he honoured us with his presence at that memorable AME Convention in Johannesburg in 1983, pointed out that in the case of acid rain, man-made sulphur dioxide emissions over Europe and North America, are up to 10 times greater than natural production. The effect of CFC's (Chloro-fluoro carbons) on the ozone layer is even worse and almost entirely of human origin and in the case of the greenhouse effect a 20% rise in atmospheric carbon dioxide was recorded since the beginning of the century.

According to him the concern about nuclear radioactivity is almost entirely self induced, and incorrect since the natural radio activity is greater than the man-made radioactivity by a factor of about 80 million.

In Germany, Switzerland and Sweden the people are against the erection of nuclear and fossil fuel stations, to such an extent that it now becomes political issues. Sweden will phase out its existing nuclear stations by 2010.

The construction of additional power stations will take place against the opinions expressed by the environmentally concerned and will be costly resulting in increased energy cost. It therefore becomes essential to educate the public in energy observation.

In America the utilities do just that at this moment in time, whilst they still experience surplus generating capacity.

Amongst others the following aspects are being done for the benefit of domestic customers:

1. Computer-aided analysis of questionnaires submitted by customers advising them on energy-conservation in homes.
2. Hire out specially constructed large capacity storage hot water heaters on condition that these hot water heaters only be used to heat water during off-peak at a reduced energy price.
3. Advising customers on energy conservation, for instance to buy modern energy efficient house-hold equipment, install energy-efficient lighting, etc. and also giving various types of incentives to encourage the use of energy efficient appliances.
4. Test the efficiency of borehole pumps and giving advice on the installation of more energy efficient pumping schemes.

Even more elaborated services are available to commercial and industrial consumers.

The Electric Power Research Institute, financed by the Utilities in the USA, does research work in energy efficient equipment on behalf of the utilities, in some instances design and test new equipment, e.g. the development of electric road vehicles, etc.

When enquiring about the benefits of this approach, it was confirmed that consumers are now found to be more educated in energy management and an awareness of energy efficiency was created. The customer also feels free to approach the utility for further information and good customer-utility relations were obtained.

Of ons nou elektrisiteit by Eskom aankoop, of self gaan opwek, ons sal 'n soortgelyke benadering moet volg. Hierdie is ook die sienswyse van die Regering, onder die vleuel van die pasgestigte Nasionale Energie Raad, soos ons van Dr D C Neethling verneem het, het Eskom reeds begin met kragbemaking of aanvaargantbestuur wat uit my oopgunt maar 'n uiterste trae ontvangs van ons kant ontvang het, maar wat nog momentum gaan kry aangesien baie reeds in hierdie verband deur Eskom vermag is.

Maar om hierdie benadering te volg, meneer die President, beteken dat ons met die toepassing van die tariewe en met die ontwikkeling van aanvaargantbestuur baie nader aan die verbruiker gaan beweeg. Dit is dus noodsaaklik om ons diens aan die verbruiker verder as die aansluiting uit te brei, en behels dit dat die lees van meters en moontlik ook die insameling van gelde deur Elektrisiteitsafdeling hanter moet word, wat myns insiens noodsaaklik is om hierdie tipe skakeling te vergemaklik. Dr Neethling in sy openingsrede, het ons belangrikheid in energieverkaffing beklemtoon en ek verstout my om te sê dat binne die beperkings van die munisipale, politieke opset kan ons nie ons rol behoorlik uitvoer nie.

Indien al die voorafgaande in ag geneem word, is dit dus noodsaaklik dat ons deur politieke sienswyse wat weer deur die omgewingsbewuste publiek geïnspireer is, gelei sal word om die doelmatige gebruik van elektriese en ook verspreiding van elektriese energie te bevorder.

Southern California Edison het onlangs bepaal dat hulle nie die balans van ongeveer R9 miljoen wat bewillig was, op aanvaargantbestuur kan bestee nie en het aanbeveel dat die bedrag na die verbruiker teruggeploeg word. Die verbruikersorganisasie het daarteen beswaar gemaak en aangedring dat die bedrag wel bestee word. Die onderneming moet nou in die oorbywende paar maande van die finansiële jaar die geld spandeer. Dit is net ter inligting van hoe ernstig die verbruiker in die VSA die inligting waardeer.

Die VME0, meneer die President, mag dan ook inskakel met die opstel van inligtingsbrosjures vir stadsrade, die druk van pamflette om radio- en televisieprogramme te ontwikkel asook videomateriaal wat in hierdie verband gebruik kan word. Die vorm wat die hulp gaan aanneem, kan nie in hierdie stadium oor besin word nie, maar dit bevestig my siening dat die VME0 'n taak het om verbeterde kommunikasie in die beskikbaarstelling van inligtingstukke daar te stel. Die beskikbaarstelling van statistieke is dan van groot belang. Die koste om TV-programme te ontwikkel is hoog en dit sal ekonomies moeilik vir elke Stadsraad wees om sulke programme die lig te laat sien en gevolglik sal die VME0 hier 'n groot rol speel.



Mnr Piet Botes, Roodepoort

Die uitgee van die publikasie VME0-Nuus was 'n baie groot mylpaal in die geskiedenis van die VME0. My enigste kommentaar is dat die VME0-bestuur die voortbestaan van die VME0-Nuus moet verseker, want die energie en entoesiasie Max Clarke gaan binne afsonbare tyd aftree en reeds nou moet ernstig besin word om toe te sien dat die VME0-Nuus gaan voortbestaan.

Bogenoemde in ag geneem, beteken dat personeel spesiaal in hierdie veld opgelei sal moet word, wat kan aansluit by my siening dat die toekomstige VME0 wel in die opleidingstaak betrokke sal raak.

Terloops, meneer die President, laat my toe om uit te wys dat ek geen Munisipale Elektrisiteitsonderneming besoek het gedurende my toer in die VSA nie. Die besoeke wat ek gedoen het, was uitsers insiggewend, maar ek voel dat meer geleer kan word met besoeke aan munisipale elektrisiteitsondernemings en een van die take van die VME0 sal wees om kontak te bewerkstellig met oorsese munisipale elektrisiteitsondernemings van verenigings en besoeke in dié verband te reël. Ek is seker dat vrugbare kennis aldus opgedoen kan word.

Ek wil van hierdie geleentheid gebruik maak, meneer die President, om aan u bekend te stel die positiewe benadering van my goeie vriend en kollega mnr Max Clarke tydens die bywoning van die Wereldkragbronkonferensie. Hy het nie 'n geleentheid laat verbygaan om die saak van die RSA te stel nie. *My sy besondere entoesiasme het hy gewoonlik 'n groot indruk gemaak.* Dit was voorwaar 'n voorreg om saam met Max Clarke die konferensie te kon bywoon.

Meneer die President, privatisering is 'n oplossing want ek kan my beswaarlik voorstel dat ons die munisipale denke van rigting kan laat verander. Ek voel dat die munisipale beperkings, soos: (1) die beperkings op die salaris van Stadsklerk en die meegaande bepalinge aangaande die salaris van die Stadslektro- en tegniek-ingenieur, ernstig na omgesien moet word om toe te sien dat die elektrotegniese ingenieur vergoed word vir sy diens mededingend met die privaatsektor. (2) Die bestuurspraktyke, soos die huidige personeelbeleid, die munisipale finansiële verordeninge, wat beperkend van aard is op die bestuur van 'n elektrisiteitsonderneming aldus te verander om toe te laat dat die onderneming volgens beginselbeginsels bestuur kan word, wat noodsaaklik geword het aangesien elektrisiteit 'n duur verbruikersitem geword het en 'n belangrike energiebron is.

Die VME0 moet ernstig betrokke raak om gesprekvoering met owerheidsweë aan te knoop, om die probleme uit te lig en 'n dryfveer te word, waarna die owerheid sal luister om nodige veranderings aan te bring. Op die huidige, soos u weet, word baie min waarde aan die opinies van 'n instansie gegee wat verantwoordelik is vir  $\pm 50\%$  van die munisipale rekening van die gemiddelde inwoner van 'n stad of dorp. Ek verstout my om te sê dat die Instituut van Verkeersbeamptes van Suider-Afrika en die Suid-Afrikaanse Brandweer Instituut meer gesag dra in regeringskringe as die VME0. Hierdie toestand moet verander en ek sien samewerking met die Nasionale Energie Raad as 'n moontlike oplossing.

Ek wil graag hier erkenning gee dat die pasafgetrede President en sy voorgangers reeds baie gedoen het en wonderlike deursigte in hierdie verband bewerkstellig het. Maar dit is nie voldoende nie. Die aangeleentheid van erkenning is van groot en dringende belang.

In die sfeer rondom die VME0 Konvensie en in gesprekvoering het dit vir my duidelik geword dat daar 'n algemene ontevredenheid oor bestuursaspekte en finansiële gebruike in stadsrade is. Dit is huishoudelik van aard en 'n mens kry net 'n vae onvergenoege klage.

Eskom vermag dat sy rekening nou binne 5/7 dae betaal moet word. Die gebruik in sommige stadsrade is dat 'n verbruiker vanaf meterlesingsdatum twee maande gegun word om sy rekening te betaal.

Ten slotte, meneer die President, het ek die aangeleentheid van die weglating van Raadslede op die Uitvoerende Raad met sekere Raadslede opgeneem wat my sienswyse deel. Graag sal ek van Raadslede wil hoor, veral lede van die huidige Raadslede op

die Uitvoerende Raad oor my voorstel. Ek voel baie sterk daaroor dat meer Uitvoerende Raadsvergaderings gehou word en die moontlikheid om die grootte van die Raadsvergaderings in te kort wat beter en vinniger beslissings kan voortbring.

Oor die naamsverandering voel ek nie sterk nie, al die funksies toegevoeg kan met die huidige VME0 vernoem word, maar indien 'n naamsverandering in die vooruitsig gestel word, behoort dit gedoen te word op 'n basis soos ek in die referaat omskryf het. Ek bepleit nouer samewerking met die Instituut van Elektriese Ingenieurs en daar behoort behoorlike verstandhouding met die Instituut opgestel te word.

#### OPSOMMING

Dit was vir my 'n voorreg om hierdie referaat te mag lewer. Ek het dit gegrond op die waarnemings en ondervinding gedurende my lang verbintenis met die VME0. Ek dink dit is vir enige organisasie noodsaaklik om van tyd tot tyd inspeksie te beoefen en enige kritiek wat in hierdie referaat geuit is, is nie daarop gemik om enigiemand te benadeel nie.

Die sake wat ek aangeraak het, is bedoel om u gedagtes te stimuleer en meer en meer 'n doelgerigte VME0 daar te stel. Ek verstout my om te sê dat die VME0 in sy huidige vorm en met sy huidige aktiwiteite waarskynlik beter funksioneer en beter resultate lewer as enige ander munisipale vereniging of instituut. Dit beteken egter nie dat ons sodanige organisasies as 'n vergelykingsbasis moet neem nie en nog minder moet ons met die hoed in die hand na ander institute kyk wat oor ons lot mag beskik. Veel eerder moet ons met oop gemoedere die toekoms tegemoet gaan ten einde ons eie beskikkingsreg daar te stel. Suiver op grond van ons ekonomiese grootte verdien ons reeds hierdie reg en met 'n geloof in die waardevolle bydraes wat ons in landsbelang kan lewer, kan die VME0 nie anders nie as om van krag tot krag te gaan.

#### VOORWOORD

Om enigsnis 'n sinvolle toekomsvisie van die VME0 te vorm, is dit noodsaaklik om te besin oor die toekomsjste veristes wat die Elektrisiteitsondernemings aan die VME0 gaan stel.

Eers is dit egter noodsaaklik om 'n sinvolle toekomslik vir die Elektrisiteitsondernemings op te stel. Sodanige oefening sluit behoorlike ondersoek van die Elektrisiteitsondernemings, rakende die bepaling van sterkpunte, swakpunte, bedreigings en geleenthede van die Elektrisiteitsondernemings. Dit behoort liefes op 'n forum te geskied, waar elke tak van die VME0 afsonderlik onder leiding van 'n kundige vergader. Hierna kan 'n gesamentlike lys opgestel word, wat verwerk kan word waaruit 'n sinvolle toekomslik deur die Uitvoerende Raad opgestel kan word. Dit is voorwaar 'n moontlikheid wat die Uitvoerende Raad met vrug behoort aan te pak. Aangesien dit nie verseenlik kan word in hierdie referaat nie, moes ek staatmaak op my persoonlike ondervinding en die menings en opmerkings wat ek van u verkry het, hetsy op takvergaderings of in gesprekke.

Gevolgtik het ek as bylae tot hierdie vooruitsiening, 'n paar opmerkings oor die Toekoms van die Munisipale Elektrisiteitsonderneming gemaak en aangeheg in die vorm van 'n aanhangsel. Die vernameste toekomsjste veristes wat die Munisipale Elektrisiteitsondernemings aan die VME0 gaan stel is:-

- 'n Meer bestuursgerigte VME0 wat in die opleidingsbehoefes op bestuursvlak van 'n elektrisiteitsonderneming sal voorsien.
- 'n Doeltreffende forum vir die lewering van referate en die verskaffing van statistiese gegewens van ondernemings.
- 'n Doeltreffende kommunikasiesstelsel vanaf die Uitvoerende Raad, Komitees en Sekretaris.
- Die uitbreiding van die status van die Munisipale Elektriese Ingenieur. Dit behels ook die uitbreiding van die Elektrisiteits onderneming se bestaansreg ten opsigte van outonomie op rekenkundige sowel as personeelbestuursterrine.
- Die verskaffing van leiding met betrekking tot kundige advies oor die bedryf aan die sentrale regering of provinsiale en streeks-owerheidsweë.

Gewoonlik word wetgewing geformuleer waarby die bedryf self weinig geleentheid gebied word om betekenisvolle bydraes te

lewer. Dit is die bedryf self wat sy toekoms moet uitkerf en die VME0 moet bereid wees om deel te neem aan enige besprekings of onderhandelinge rakende toekomstige veranderings. As 'n erkende spreekbuis van die bedryf, behoort die VME0 ook die sinswyses van die bedryf aan die Wetmakers oor te dra. Aangesien elektrisiteitsondernemings 'n uiters groot finansiële fasel van die volkshuishouding verteenwoordig, is die betekenisvolle deelname in wetgewende prosesse wat betrekking het op die bedryf, meer as geregverdig.

#### 1. DIE SAMESTELLING VAN DIE UITVOERENDE RAAD

Die VME0 het in die jaar 1915 tot stand gekom as "The Association of Municipal Electrical Engineers (Union of South Africa)". Met sy stigting het die AMEE oor 22 lede uit 17 stede en dorpe beskik. (Die bestuurder van die trefwê-afdeling was ook lid.) Tydens die konvensie van 1987 het die ledetal uit 185 lede uit 190 ondernemings bestaan.

In 1935 word lidmaatskap aan Raadslede toegeken en een van die doelstellings van die Vereniging was "To bring Municipal Electrical Engineers & Chairmen and Members of Municipal Electricity Committees together." Die Uitvoerende Bestuur het bestaan uit 'n President, Onder-President, twee onlangs afgetrede Oud-Presidente, (almal synde ingenieurslede) en ses ander lede, waarvan twee Raadslede mag gewees het. Die naam word ook herdoop na die Vereniging van Munisipale Elektrisiteits Ondernemings van Suid-Afrika en Rhodesië.

In die jaar 1950 word die aantal Raadslede vermeerder na agt. Die Raadslede word nie meer verkies nie, maar die Raadslede van die verkose ingenieurslede (uitsluitend die pas afgetrede oud-Presidente op die Raad), word outomaties lede van die Uitvoerende Raad. In die bespreking van die voorstel was voorgestel dat Raadslede na verkryging van die Sakelys self kon besluit of hulle die vergadering sou wou bywoon, na gelang van die tegnies inhoud daarvan.

Hierdie besluit is geneem toe Eskom met die na-oorlogse ontwikkeling nie oor genoegsame opwekkingsvermoëns beskik het nie en daar gereeld samesprekings tussen Munisipaliteite en EVKOM plaasgevind het oor die gevolglike onderbrekings. Die hulp van Raadslede het hiertydens heelwat gewig gedra.

Na kleiner veranderings aan die Grondwet vind die volgende groot verandering in 1981 plaas. Kwalifikasies van ingenieurslede word geskap, oud-Presidente en hulle Raadslede word outomaties lede van die Uitvoerende Raad, mits die oud-President nog lid is en homself beskikbaar stel vir diens op die Uitvoerende Raad en drie Ingenieurslede word bo en behalwe een lid vir elke tak by die Konvensie verkies.

Volgens hierdie bedeling bestaan die Uitvoerende Raad uit 'n President, Aangewese President, 'n aantal oud-Presidente en agt Ingenieurslede tesame met hulle Raadslede.

Vir die 1989/91 tydperk is daar net twee oud-Presidente, (ek gaan my nie meer beskikbaar stel nie) en gevolglik sal die Uitvoerende Raad uit twaalf Ingenieurslede en twaalf Raadslede bestaan. Ek is egter van mening dat so 'n groot komitee nie bevoorlê vir doeltreffende bestuur is nie.

Ek wil my verstout om te sê dat die oorspronklike doelstellings vir die insluiting van Raadslede op die Uitvoerende Raad, naamlik, "To bring Municipal Electrical Engineers & Chairmen and Members of Municipal Electricity Committees together", nie meer van pas is nie behalwe miskien in die groter stede waar 'n Elektrisiteitskomitee van die een of ander aard bestaan. Raadslede wat afgevaardig word, word meestal willekeurige verkies sonder inagneming van vermoëns om sinvolle bydraes te kan lewer op grond van 'n besondere kennis van elektrisiteitsvoorsieningsgeleenthede nie. By uitsondering is hulle bydrae baie beperk en hulle bywoning van Uitvoerende Raadsvergaderings is ook swak.

Daar word gedurig gepraat van die andersheid van die VME0 as gevolg van Raadslede wat op die Uitvoerende Raad dien teenoor ander Institute en Verenigings. Het hierdie "andersheid" van die VME0 meegebring dat die VME0 meer bekend is as die ander institute? Ek het rede om te glo dat juis as gevolg van die "andersheid" van die VME0 daar minder waarde aan

die status van die VME0 as aan ander institute geheg word. Dit verg hoe koste om Uitvoerende Raadsvergaderings te reël, dit wil sê, om voorsiening te maak vir 24 lede vir vervoer, verblyf en konferensiegeriewe. Die grootte van die Raad bemoeilik die taak van die President om 'n sinvolle vergadering waaruit sinvolle besluite spruit, te fasiliteer. Ek vra die vraag of die getal Raadslede wat op die Uitvoerende Raad dien nie tot twee beperk behoort te word nie, naamlik die Raadslede van die President en die Aangewese President.

Die dienslewering van Oud-Presidente word ook bevraagteken, tensypte van die goeie resultate van die afgelope paar jaar. Behoort Oud-Presidente hulleself nie eerder beskikbaar te stel tydens die verkiesings nie? Is Oud-Presidente nie besig om ander lede se kans te ontwikkel te belemmer nie? Is dit nodig dat Oud-Presidente stemreg op die Uitvoerende Raad besit?

Die voorafgaande gegewe, sal die Uitvoerende Raad dan uit 12 lede bestaan wat baie meer sinvolle besluite kan voortbring. Die Uitvoerende Raad kan enige Raadslid wat oor besondere deskundigheid beskik, koöpteer.

## 2. DIE DAGBESTUUR

Die dagbestuur het by geleentheid heelwat onder die vuur gekom deur hom in te meng met besluitneming oor items wat moontlik deur die Uitvoerende Raad moes gedoen gewees het. Deur die getal Uitvoerende Raadslede in te perk kan dit oorwegend word om die Dagbestuur uit te skakel en om elke drie maande 'n Uitvoerende Raadsvergadering te hou, wat net tot voordeel van die verskillende komitees sal wees. Hierdeur kan beter bestuur beoefen word. Sekere besluite en magtigings wat duidelik omskryf is, behoort aan die President, Aangewese President en die Sekretaris toegeken te word om daaglikse dringende sake af te handel. Ander institute het baie meer Uitvoerende Raadsvergaderings.

Die rede waarom die VME0 dit net 2 keer per jaar belê, is as gevolg van die ongemaklike grootte van die Raad. Die komitees moet by tye self besluite neem, of poog dat die Dagbestuur 'n besluit neem, aangesien daar nie 'n Uitvoerende Raadsvergadering binne die tydval beskikbaar is nie.

## 3. DIE SAMESTELLING VAN SUBKOMITEES VAN DIE UITVOERENDE RAAD

Die Subkomitees van die Uitvoerende Raad funksioneer goed en het oor die afgelope aantal jare wonderlike prestasies gelewer. Dit raak egter toenemend moeiliker om komitees spoedig saam te roep en getalle kan moontlik beperk word. Meer en gereelde Uitvoerende Raadsvergaderings is noodsaaklik en op elke vergadering kan die vorderingsverslae voortdurend gemonitor word.

Die Elektriesiteitsvoorsieningskomitee, wat 'n magdom sake hanteer, behoort uit die lede van Kaapstad, Port Elizabeth, Durban, Johannesburg en Pretoria te bestaan, ongeag of hulle op die Uitvoerende Raad verkies is al dan nie. Bykomende vyf lede van ander dorpe en stede behoort ook op die komitee te dien, sodat elke tak verteenwoordig is. Die siening van groter stede is by tye geheel en al verskillend van die van die kleiner dorpe of stede, veral met kraagaankope, tariewe en ornamente van bates. Dit is noodsaaklik dat die Verteenwoordiger van die VME0 op die Elektriesiteitsraad ook op hierdie komitee dien, maar verkieslik nie as Voorsitter nie.

Die verkiesing van 'n lid op die Uitvoerende Raad moet nie slegs 'n eerbetoon beskou word nie, maar die persoon moet besef dat hy verkies is om diens te lewer. Sodanige siening was tot onlangs nog deur sekere verkosenes op die Raad gehuldig.

## 4. UITVOERENDE RAADSVERGADERINGS

Die Uitvoerende Raadsvergadering moet behoortlik deur die President beplan word en hiermee bedoel ek nie: (1) die verkiesing van 'n saal of geriewe nie; (2) vervoerreëlings en/of verblyf vir ander lede van die Raad; (3) gesamentlike etes of vergaderingfasiliteite nie. Die President moet leiding kan gee; geronde besluite uit die vergadering verkry en sy volle betrokkenheid by die opstel van die sakelyste en die inhoud van komiteeverslae aan die Raad skenk. Dit is noodsaaklik dat hy 'n plan van aksie moet opstel om die optimale benutting van so 'n ver-

gadering te verkry en moet nie bemoei word met die ander reëlings van die vergadering nie.

Die huidige Uitvoerende Raadsvergaderings van 'n Konvensie behels gewoonlik die samestelling van Komitees en die oplegging van take vir die volgende termyn. Hierdie vergadering word ook gekenmerk deur die feit dat lede haastig is om te vertrek en die President bevind hom onder druk om die vergadering so spoedig moontlik af te handel. Om hierdie rede is 'n Uitvoerende Raadsvergadering kort voor die Konvensie of Tegniese Vergadering noodsaaklik, waar tersaaklike sake vir oordrag aan die Tegniese Vergadering of Konvensie bespreek kan word. Die vergadering na die Konvensie kan dan tot die samestelling van Komitees en oplegging van take aan individue beperk word. Hieruit is dit duidelik dat daar net een vergadering van die Uitvoerende Raad per jaar is, waar die sake van die Vereniging behoorlik aandag geniet. Sels hier kry 'n mens die indruk dat lede die oggend wil arriveer en weer vroeg wil vertrek. Die President is dus onder druk geplaas om die vergadering so laat as moontlik te begin en weer so vroeg as moontlik te verdaag. Is dit bevoorlieflik vir goeie besluitneming? Behoort 'n kleiner Uitvoerende Raad nie te oornag nie, sodat die vergadering so vroeg moontlik 'n aanvang kan neem? So 'n reëling sal meer bevoorlieflik vir goeie huishouding wees.

Daar word besef dat groter kostes hiermee gepaard gaan, maar dit is duidelik in die belang van 'n sinvoller funksionering van die Vereniging.

## 5. DIE HUSHOUDING VAN DIE SEKRETARIS

Sonder om die verlede op te roep, moet hier groot waardering uitgespreek word teenoor ons huidige Sekretaris. Vanuit 'n finansieel en administratiewe oogpunt het die VME0 uiters goeie diens verkry sedert die VME0 met sy aansoekvoordrag feitlik middelklas was. In teenstelling is ons huidige finansiële sterk.

Betreffende effektiewe administrasie, sal die toekoms baie hoër eise stel, veral met betrekking tot kommunikasie. Dit is dus belangrik dat —

1. wanneer die Sekretaris afwesig of met verlof is, daar iemand is wat die kantoor sinvol kan beman;
2. inligtingsbrosjures oor Uitvoerende Raadsbesluite die lede gereeld sal bereik;
3. Voor of na Konvensies en Tegniese vergaderings behoort die Stadsraad, wat as gasheer optree, so min moontlik belas te word met die opstel van verrigtinge, verkryging van referate, tikwerk, ens. Dit is uitsluitlik die werk van die Sekretaris en hy behoort inigerig te wees om hierdie sake te kan hanteer.
4. Die enigste verslag wat tydens 'n Konvensie voorgelê behoort te word, is die Sekretariële en Finansiële verslag. Verslae wat aan die Konvensie voorgelê word, is reeds verouderd wanneer dit dien en moet gewoonlik bygewerk word. Enige belangrike mededeling wat voortvloei uit die werking van subkomitees moet gedurig deur middel van 'n verbeterde kommunikasiestelsel vanaf Komitees via Uitvoerende Raad van die Sekretaris se kantoor na lede gevoer word. Rekordhouding van komiteeverslae hoort by die notules van Uitvoerende Raadsvergaderings en met die nodige korrespondensie, soos deur die Uitvoerende Raad gemagtig, na lede deurgestuur word wanneer dit nog tersaaklik is.

## 6. DIE FUNKSIONERING VAN DIE PRESIDENT EN DIE AANGEWESSE PRESIDENT

Die President en so ook die Aangewese President moet losgemaak word van die pligte met betrekking tot referate en ander administratiewe reëlings vir 'n Konvensie of Tegniese vergadering. Dit is uit en uit 'n taak van die Sekretaris en sy personeel.

Nog die President nóg die Aangewese President behoort op die referate-komitee te dien. Hulle mag egter behulpsaam wees om deur middel van die Uitvoerende Raad 'n tema vir die beoogde Konvensie of Tegniese Vergadering te bepaal.

Hiermee bedoel ek dat die Uitvoerende Raad die tema van die Konvensie of Tegniese vergaderings moet bepaal, waarna die subkomitee, waarop die Sekretaris persoonlik dien, die nodige referate aanstel, reëls neer lê, doeldatums stel, administratiewe hulp aan die referate lewer en die nodige apparaat verskaf vir professionele aanbiedings. Die President word dan net

oor die nodige reëlings ingelig sodat hy die relevante inligting behoorlik kan oordra.

Die President asook die Aangewese President moet die beeld van die Vereniging te alle tye bevorder, soveel as moontlik amppligte waarnaem en die aktiwiteite van die VMEQ aan ander instansies bemark. Behoorlike kennis van die komitees word vereis en vordering van komitees moet gereeld deur die President gemonitor word, sodat hy tydens die Uitvoerende Raadsvergadering op hoogte van sake is.

## 7. NAAMVERANDERING

As ons dan na vereistes wat die Elektrisiteitsondernemings aan die VMEQ gaan stel, sowel as voormelde voorstelle kyk, dan moet ons aandag gee aan die Naamverandering wat reeds vir 'n geruime tyd bespreking uitgelok het. (Met naamverandering bedoel ek die oorgang tot die stigting van 'n instituut.)

Daar behoort eerstens bepaal te word of private elektrisiteitsondernemings binne en buite die Republiek lid moet wees van die nuwe organisasie. Daarbenewens kan ESKOM nie uitgesluit word nie, aangesien dit deel van die hele bedryf vorm en groot bydraes lewer.

Dit is vir my duidelik dat 'n Instituut sekere voordele inhou, veral wat betref die bestuursopleidingsaspek, wat dan inpas by die opleidingsvereistes wat die instituut aan sy lede maak stel. Die instituut kan dus instrumenteel wees om jong aspirant-bestuurders op te lei in die bestuur van die bedryf as sulks.

Lidmaatskap van individue in plaas van ondernemings moet oorweeg word en sal 'n wesentlike invloed hê op die naam van die instituut. Dit lewer probleme op in soverre ons terugkeer na kwalifikasies van lidmaatskap. Dit kan egter oorbrug word deur lidmaatskapgradering ten tye van die stigting vir huidige lede te behou.

Daar moet egter teen oorvleueling met die Instituut van Elektriese Ingenieurs gewaak word.

Indien 'n instituut gestig word, behoort daar indringend met die Instituut van Elektriese Ingenieurs oor 'n werkbare verhouding ooreenkomstig te word. Die Instituut van Elektriese Ingenieurs sal meer tegniese geïntereerd wees teenoor die instituut wat die VMEQ sal vervang, wat meer op elektrisiteitsondernemings se bestuurskundigheid sal konsentreer.

Die hele probleem berus by die verkryging van lede se goedkeuring van 'n naamverandering en in die besonder word die volgende knelpunte nie behoorlik aan lede oorgedra nie:

1. Hoekom moet ons raadslede se lidmaatskap beëindig; ons het so 'n goeie verhouding?
2. Dit sal meebring dat terugkeer word na klassifikasie van lidmaatskap en gevolglik moontlik verlies aan status.
3. Die rede waarom die naam verander word, is vaag en word nie toegelig nie. Watter voor- en nadele sal verkry word?

Om 'n naamverandering te bewerkstellig, behoort die Uitvoerende Raad eers te besin oor 'n konsep-grondwet, nie in detail nie, maar wat die kernpunte van 'n verandering omvat. Gewaags hiermee behoort die President, in oorleg met die plaaslike takvoorsitters, 'n spesiale vergadering van elke tak te belê, waar kundige lede van die Uitvoerende Raad die kwessie van 'n naamverandering, wat die stigting van 'n instituut insluit, in referaat voorlê. Die tak kan dan oorgaan om sterk en swak punte van so 'n instituut te ontlee en sodoende 'n standpunt formuleer.

Myns insiens is die voorafgaande 'n sinvolle weg waartydens hierdie aangeleentheid benader kan word. Met die huidige struktuur waar die Uitvoerende Raad uit 24 lede bestaan, het ek egter ernstige bedenkinge of 'n betekenisvolle besluit oor die naamverandering verkry kan word.

## AANHANGSEL: DIE MUNISIPALE ELEKTRISITEITS-ONDERNEMING

### TAAK VAN ELEKTRISITEITS-ONDERNEMING

Die taak van die Elektrisiteitsonderneming is om elektriese energie sinvol aan inwoners teen mededingende pryse op die energiemark te verskaf. Die taak eindig nie by hierdie omskrywing nie maar vereis ook 'n ononderbroke elektrisiteitsvoorsiening van voldoende gehalte. Daar is geen middeweg nie, die lig is of "aan" of "af". By ander dienste kan tydelike herstelwerk, of staking vir 'n tydperk geen probleme veroorsaak nie en funksioneel voortgaan, maar nie by elektrisiteitsvoorsiening nie. As gevolg hiervan moet behoorlike strategieë vooruitbeplanning om die toekomstige verbruikspatroon te akkommodeer, gedoen word, met 'n behoorlik opgeleide en produktiwiteitsgeïntereerde instandhoudingsdiens as voorvereiste om 'n aanvaarbare diens te lewer.

Stadsraadslede is bewus van hierdie vereistes en sal selde 'n verslag van die Elektrotegniese Ingenieur teenstaan. Dit sigself plaas 'n groot verantwoordelijkheid op die skouers van die Elektrotegniese Ingenieur teenoor sy Raad en teenoor sy kollegas in die bestuurspan van die Raad. Hierdie aspek word nie altyd waardeer nie en by tye word vry-ernstige kommentaar gelewer wat soos volg lui: "Die Elektrotegniese Ingenieur het weer 'n slenter gewerk."

### Die Toekomstige Elektrisiteitsonderneming

Die huidige munisipale opset is sulks dat die elektrisiteitsdepartement verantwoordelik is om elektrisiteit aan te koop en/of op te teek, 'n infrastruktuur te skep vir die verspreiding van elektrisiteit, die daarstelling van 'n tersaaklik toegepaste aansluitingspunt en toetsgeriewe vir die bedraging van die persele van die verbruiker. Die aanskakeling, lees van meters, prosessering en lewering van die rekening en afskakeling word deur die Stadsresourier uitgevoer, sowel as die rekenkundige verwerking van aankope, projekte ensovoorts.

Deur die meterlesingenrekenings en invorderingsaksies deur die elektrisiteitsvoorsieningsonderneming te laat uitvoer, kan die volgende voordele verkry word:

1. Die doel en strewe van die personeel betrokke by meterlesing, rekeningverwerking en by inkomste-invordering, sal inskakel by die doel en strewes van die betrokke elektrisiteitsonderneming.
2. Klages by die inkomste-toonbank kan meer doeltreffend hanteer word as by personeel wat net belangstel in die in van inkomste. Dit beteken dat die nie-tegniese personeel opgelei sal kan word om klages en probleme van die publiek bevredigend op te los en om kragbemarking te bevorder.
3. Die verkryging van toepaslike rekenaars en rekenaarprogramme sal 'n groot voordeel vir die elektrisiteitsonderneming meebring. Dit moet erken word dat die rekenaarbedryf by die elektriese ingenieursbedryf inskakel en nie by die stadsresourier nie. Sodanige programme kan aangepas word om sinvolle statistieke aan die Elektrotegniese Ingenieur te verskaf.
4. Betekenisvolle produktiwiteitsyfers kan verkry word, waar die verantwoordelijkheid vir en beheer oor die in- en uitsette 'n een departement gesetel is.

Om bogenoemde dienste oor te neem, is die gebruik van rekenkundige personeel in die bestuur van die elektrisiteitsonderneming 'n noodsaaklikheid. Hierdie rekenkundiges, onder die bestuur van die elektrisiteitsonderneming, moet dus die doel en strewe van die elektrisiteitsonderneming bevorder. Hieruit volg dat die rekeninging van aankope, materiaalbeheer en projektoesverrekening ook deur die elektrisiteitsonderneming gedoen word. Indiensopleiding van multidissiplinêre tegniese rekenkundiges kan meer sinvol wees. Die finansiële sterkte van die elektrisiteitsonderneming word al groter en is besig om die finansiële opset in plaaslike bestuur te oorheers. Die finansiële toesig moet derhalwe meer op besigheidsbeginsels toegespits word, eerder as om die huidige opset van gewone rekenkundige boekhouding te handhaaf. Hierdie diens is van onskatbare

waarde indien 'n elektrisiteitsonderneming behoorlik bestuur moet word.

Ander dienste, soos inkomste van watervoorsiening, ensovoorts, kan ingesakel en gesamentlik deur die ingenieursdepartement uitgevoer word.

Die stadstoesourier sal dan onthef word van verpligtinge wat eintlik net behoorlik uitgevoer kan word deur tegniek-vaardige personeel en kan hom gevolglik toespits op die suiwer makro finansiële aspekte van die betrokke plaaslike bestuur. Hierdie werking word reeds by verskeie private ondernemings toegepas en dit is net bevorderlik vir die bestuur van 'n elektrisiteitsonderneming volgens suiwer besighheidsbeginsels.

Duplisering van werkverrigting kan onderling deur behoorlik gedefinieerde velde van verantwoordelikheid uitgesakel word. Die beginsel van selfstandige besighheidsseenhede sal baie verbruikersprobleme uitsakel.

'n Afsonderlike mannekragfunksie wat op die eiesoortige behoeftes van 'n elektrisiteitsonderneming rakende die voorsiening, instandhouding en ontwikkeling van personeel ingestem is, word as 'n noodsaaklikheid beskou. Sodanige funksie moet los staan van die normale munisipale opset en klem moet grootliks op die terrein van doelgerigte opleiding van vakmanne, tegnisi en ingenieurs val.

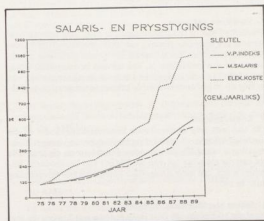
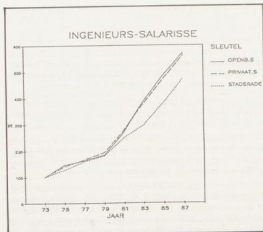
### Moontlike Strukture

Ek is van mening dat dit noodsaaklik is dat die beperkinge op die bestuur van 'n elektrisiteitsonderneming daargestel deur die huidige munisipale opset, ingrypend verander moet word sodat die elektrisiteitsonderneming op 'n suiwer besighheidsgrondslag bestuur kan word. Dit kan gedoen word deur (1) privatisering; (2) 'n stelsel van munisipale bestuur instel wat die elektrisiteitsonderneming nie met die munisipale bestuursopset koppel nie. Dit behels 'n sisteem waar die elektrisiteitsdepartement alles behartig, tot selfs die invordering van inkomste, oor sy eie personeel en finansiële bestuur beskik, onder die inwoners bestaan. Kortliks kom dit op 'n gedentraliseerde stelsel neer; (3) die saamgroepering van elektrisiteitsondernemings onder die Streksdiensterade, met die voorbehoud dat dit nie in 'n poel met ander dienste soos watervoorsiening, ensovoorts, gekoppel word nie. Die groepering van handelsdienste bly wel 'n opsie wat oorweg behoort te word. Ek pleit dus 'n gedentraliseerde munisipale bestuurstelsel wat aan hedendaagse eise kan voldoen.

Ek vermoed dat hierdie aangeleentheid tans ondersoek word. My persoonlike mening is dat 'n elektrisiteitsonderneming met 'n veranderde bestuurstelsel by die plaaslike bestuur gesetel moet wees, maar terselfdertyd pleit ek vir 'n beter bestel.

### Salarisse

Die vergoeding aan munisipale amptenare is, benewens die feit dat 'n demper op die struktuur geplaas is deur die vaspenning van die Stadsklerk se salaris, onderhewig aan streng handhawing op beroepe deur die sentrale regering om salarisse nie aan te pas nie of te beperk. Hieraan word deur munisipale owerheidsweë streng gehoor gegee, maar wanneer aanpassings daarna gedoen word, word hierdie feit nie met die daaropvolgende verhoging in aanmerkings geneem nie. Die afgelope paar jaar is getekniker deur die feit dat munisipale salarisse na 'n oproep deur die Staatspresident nie aangepas is nie, terwyl in die openbare en private sektore wel deeglik aanpassings gedoen is. Met die volgende aanpassing was die aanpassings in die openbare en private sektore weer dieselfde, met ander woorde die munisipale amptenaar verloor een jaar se aanpassingspakket teenoor die ander sektore. Dit word duidelik weerspieël op grafiek "A" wat die jaarlikse groei van die salaris van die elektrisiteitsingenieurs in die openbare en private sektore met die salaris van 'n senior ingenieur weergee, met 1973 as 100%. Hieruit kan gesien word dat vanaf 1981 die jaarlikse salarisgroei van die Elektrisiteitsingenieur in die plaaslike bestuurstelsel nie tred hou met die verhogings in die openbare en private sektore nie. Dit word ook weerspieël in die feit dat daar reeds vir 'n tyd lank probleme ondervind word om vakatures van Elektrisiteitsingenieurs te vul. Grafiek "B" toon ook die styging in elektrisiteitskoste, stads-



elektrotegniese ingenieur se salaris en die V-koste-indeks in verhouding tot mekaar met die jaar 1975 as basis.

Indien die munisipale sektor nie homself regruk nie sal die skaarste aan elektrotegniese ingenieurs in die munisipale sektor al groter word. Alternatiewelik moet elektrisiteitsondernemings privatiseer, om uit die munisipale personeelvergoedingsmark gelig te word.

### Toekoms

Ons is op die vooraand van veranderings wat sekerlik die toekoms van die munisipale elektrisiteitsonderneming gaan raak. Behalwe die sosio-politieke skommelings, is daar ander faktore soos die moontlike privatisering van Eskom. Dit lei geen twyfel nie dat indien Eskom privatiseer, daar verskeie ander benaderings op elektrisiteitsvoorsiening gaan plaasvind. Indien Eskom nie privatiseer nie, mag die moontlikheid bestaan dat Eskom belaaarbaar gemaak word, met die gevolglike belaaarbaarheid van munisipale elektrisiteitsondernemings. Dit is ook 'n feit dat sekere munisipale elektrisiteitsondernemings wel geprivatiseer sal word.

Die geweldige openbare gevoel dat elektrisiteitsaankope direk vanaf Eskom heelwat goedkoper sal wees as die vanaf 'n munisipaliteit, kan 'n groot nadelige invloed hê. Hierdie gedagte kring meer en meer uit en selfs blankes is onder die indruk dat hulle elektrisiteit by Eskom teen meer as 50% afslag op hul huidige kostes verkry.

Die algehele gedagterigting van privatisering, of dit nou sal geskied of nie, sal meebreng dat al meer en meer druk uitgeoefen sal word om elektrisiteitsondernemings volgens besighheidsbeginsels te bestuur. Hierdie sieningswys sal 'n aanvaag skep na goed-opgeleide bestuurders en as die munisipale elektrisiteits-

genieur sy plek wil volstaan, sal die volgende eise aan die VMEO gestel word.

### 1. Opleidingstaak

Die ingenieur en ander tegnisiërs verkry opleiding op universiteite en technikon, waar voldoende kapasiteit vir opleiding bestaan. Daar is egter 'n tekort aan beurse want stadsrade in hulle pogings tot besparing, sny alle beurse. Dit is kortsigtig.

In groter stede word bestuursopleiding aan ingenieurs verskaf maar by ander stede en veral onder die huidige ekonomiese druk, word hierdie opleiding uitgeskakel.

Die opleiding van 'n hoof van 'n elektrisiteitsdepartement verg nie net bestuurskennis nie, maar ook goeie rekenkundige kennis, met klem op die ekonomiese aspekte van opwekking, verspreiding, verkope en bemarking van elektrisiteit.

Dit sal dus van die VMEO vereis word om hierdie tipe opleiding aan sy lede beskikbaar te stel, hetsy self, deur technikon, of deur universiteite. Die daarstelling van 'n leerstoel aan 'n universiteit mag in die vooruitsig gestel word soos reeds deur Pretoria voorgestel. Hierdie bestuursopleiding moet eie aan die munisipale elektriese bedryf wees.

### 2. Statistiese gegewens

Die bedryf van 'n elektrisiteitsonderneming verg aanvaarbaar vertroubare verbruikstatistieke van mede-ondernemings, Eskom en ander instansies. Dit is moeilik om hierdie statistieke te bekom en die wat beskikbaar is, kan dikwels bevraagteken word. Die VMEO is die gesagspunt vorm om hierdie statistieke van sy lede op 'n gestandaardiseerde manier te versamel en beskikbaar te stel.

### 3. Kommunikasie

Die toekoms vir doeltreffende kommunikasiekanaale en die snelle tegnologiese ontwikkeling vereis beter en vinniger kommunikasie vanaf VMEO uitvoerende bestuur na die lede. Die rol van die plaaslike tak van die VMEO kan bes moontlik uitgebrei word, om meer doelgerigte kommunikasie en opleiding daar te stel.

### 4. Status van Elektriese Ingenieur

As al die voorafgaande feite in ag geneem word, word die status van die elektriese ingenieur al verder en verder verlaag in die munisipale hiërargie. Hierdie aangeleentheid sal die dringende aandag van die VMEO verg. Met al die onlangse vordering op hierdie gebied in aanmerking geneem, is ek pessimisties en kan die toekomstige bestuurder van 'n elektrisiteitsonderneming iemand van 'n ander beroep wees, wat so reg in die kraal van die stadsverre en die sentrale regering val. Die ingenieur behoort tot daardie tegniese amptenaar wat oor geen bestuursopleiding beskik nie, en selfs in eie geleedere word gesê "dat dit nie in landsbelang is as 'n Elektrotegniese Ingenieur aansoek doen vir die pos van Stadsklerk nie". Waar pas die Ingenieur dan in? Is hy gedoem om minderwaardig in die Munisipale opset te wees?

### ERKENNINGS

*Dank:* Die Sentrale Statistiekdiens, Pretoria en die Instituut vir Arbeidsekonomiese avorsing — RGN Pretoria, vir statistieke aan my voorsien.

Mnr Coetzee, Van Rooyen en mev Leygonie, almal van die Elektrisiteitsafdeling van Roodepoort, vir hul bydrae en hulp. Mnr Heinz Schenk van die Kamer van Mynwese, vroeër van die Elektrisiteitsafdeling van Roodepoort, vir sy bydrae.

### MNR J A LOUBSER: BENONI

Mnr. die President, voordat ek begin laat my toe om ook my gelukwens tot u verkiesing as president van hierdie organisasie by die van ander te voeg. Ek ken u nou al 'n hele paar jaar en weet dat u 'n werkywer het wat deur min ander ingenieurs oortref kan word, maar onthou ook asseblief dat ons almal hier teenwoordig tog te gewillig sal wees om u te help waar ons kan.

Baie geluk en sterkte vir die volgende twee jaar.



Mnr J A Loubser, Benoni

Mnr die President, mnr Botes het in sy referaat 'n paar vereistes genoem wat munisipale elektrisiteitsondernemings aan die VMEO gaan stel o.a. 'n meer bestuurigerige VMEO, 'n beter forum vir die lewering van referate, 'n meer doeltreffende kommunikasiestelsel, die verskaffing van leiding en kundige advies en dan die een wat my die meeste aanstaan, die uitbreiding van die status, of erkenning van die munisipale elektrisiteitsondernemings se bestaanreg ten opsigte van outonomie op rekenkundige sowel as personeelbestuursterreine. Mnr Botes meen dat ons selfs so ver moet gaan om self rekeninge uit te stuur en ook die personeelaanstellingsfunksie oot te neem. Laasgenoemde word gelukkig by Benoni deur 'n afsonderlike departement in oorleg met die elektrotegniese stadsingenieur gedoen. Die rompslomp is dus iemand anders se verantwoordelikheid.

Wat die tesourie-funksies betref, het mnr. Botes in die aanhangsel tot sy referaat die voordele uitgespel indien ons heeltemal outonoom word. Ek stem heelhartig daarmee saam en as die idee verder uitgebrei word, is dit nie onmoontlik dat elektrisiteitsvoorsiening heeltemal gepriwatiseer word nie. Tans is daar probleme om te bepaal wie verantwoordelik moet wees vir elektrisiteitsvoorsiening in kleiner dorpe omdat sodanige dorpe nie die nodige personeel kan bekostig nie. Die oplossing kan moontlik gesoek word in 'n, as 'n voorbeeld, "Oos-Randse Elektrisiteitsraad" of wat ook al. Hierdie raad se pligte sal dan behels die elektrisiteitsvoorsiening na alle gebruikers in sy gebied. Die kleinste sowel as die grootste dorpe, en dit maak ook nie saak of dit 'n wit of enige ander dorp is nie.

Die groot probleem lê egter in die bydrae wat alle voorsienings-ondernemings maak tot die verligting van erfbelasting, wat in die meeste gevalle meer as 10% is en gevolglik hou stadsrade nie van hierdie idee nie. Maar veronderstel nou hierdie privaats-onderneming kan elektrisiteit byvoorbeeld 10% goedkoop voorsien en daardie selfde bedrag word dan by erfbelasting gevoeg dan betaal die verbruiker mos presies dieselfde bedrag! Dit sal natuurlik 'n voorvereiste wees dat sodanige "Elektrisiteitsraad" nie onderhewig moet wees aan inkomstebelasting nie.

Ek stem ook saam dat die VMEO die spreekbuis van die bedryf moet wees, maar hoe gaan ons ons sienswyse aan die wetmakers oordra?

Die probleem bly nog steeds dat niemand weet wie of wat is die VMEO nie. Ook het ons nog steeds die probleem met die naam van ons siviele kollegas n.l. die "Instituut van Munisipale Ingenieurs".

Ek wil met mnr. Botes saamstem dat die samestelling van die Uitvoerende Raad te lomp kan raak en die Uitvoerende Raad sal hieraan aandag moet gee. Ek stem egter nie saam met sy



siening i.s. die rol wat raadslede daarin speel nie, maar voel dat elke uitvoerende raadslid kan sorg dat 'n sekere raadslid van wêre sy besondere kennis en vermoë altyd saam met die ingenieur by die kongresse en moontlik ook die tegniese vergaderings kan bywoon. Net soos onsef leer raadslede ook deur die bywoning van die kongresse en met verloop van tyd word hulle bydraers meer en beter. Kontinuiteit van raadslede is dus baie belangrik.

Mnr. Botes noem ook dat oud-presidente nie stemreg op die Uitvoerende Raad moet hê nie. Hoekom nie? Die mense se objektiwiteit word mos nie aangetas deur die woord "oud" nie! Buitendien word daar baie selde gestem oor 'n onderwerp. Eintlik net by die samestelling van komitees.

Die Dagbestuur se samestelling is redelik onlangs gewysig, juis op voorstel van mnr. Botes en daar is ook reeds besluit om in die toekoms drie uitvoerende raadsvergaderings te hou in plaas van twee.

Insake die samestelling van die subkomitees van die Uitvoerende Raad stem ek met mnr. Botes saam, in besonder met die samestelling van die Elektriesiteitsvoorsieningskomitee. Die verteenwoordiger op die Elektriesiteitsraad is buitendien in die ongemaklike posisie dat hy amper twee here dien, die VMEQ en Eskom.

Ek hou ook van mnr. Botes se voorstel dat 'n uitvoerende raadsvergadering kort voor 'n konvensie gehou word. Die Uitvoerende Raad sal hieraan aandag moet gee.

Mnr. Botes noem ook dat die president asook die aangewese president losgemaak moet word van die pligte met betrekking tot referate en ander administratiewe reëlings vir 'n konvensie of tegniese vergadering. Dit is so dat die aangewese president gewoonlik so 'n konvensie reël en dit sluit ook die referate in. Dit is iets waarop hy trots moet wees en ek voel dat dit so moet bly. Alhoewel die Referate-komitee uit die president en die aangewese president bestaan, werk dit in die praktyk so dat die aangewese president die referate vir die konvensie reël en natuurlik reël dieselfde persoon dan (as president) die referate vir die tegniese vergadering. Met die nuwe reëling wat van hierdie jaar af geld, lewer die president sy presidentsrede aan die einde van sy termyn. Dit gee hom kans om al sy aandag daaraan te wy aangesien die reëlings vir die konferensie deur sy opvolger gedoen moet word.

Insake die naamverandering kan ek nou rapporteer dat daar reeds besluit is om nie daarmee voort te gaan nie omdat al die takke daarteen gestem het, maar wat mnr. Botes in die verband gesê het is baie waar. Hierdie hele poging is nie op die regte wyse aangepak nie. 'n besoek aan die takke om die saak te stel asook 'n referaat in die verband sou baie meer vrugte afgewerp het. Ek persoonlik voel nog sterk daaroor omdat ek agterkom dat die naam "Instituut" baie meer waarde dra as "Vereniging". In die afgelope week was ek weer by 'n Subkomiteevergadering van die NASKOK Koördinerende Raad waar daar in die notule van die vorige vergadering gepraat is van die Instituut van Elektrotegniese Ingenieurs bedoelende hierdie vereniging.

Ten slotte, mnr. die President, wil ek net sê dat hierdie so 'n interessante referaat is dat ek nog baie meer daaroor kan sê, maar ek moet my doelbewus daarvan weerhou om nie weer 'n referaat op 'n referaat te lewer nie. Mnr. Botes het aan my genoem dat hy gesukkel het met die opstel van hierdie referaat. As dit is soos 'n mens "sukkel" dan is my raad aan hom "sukkel" maar voort, ons geniet dit. Baie geluk met 'n uitstekende referaat!

**MNR COEN SCHERMAN: PRETORIA**  
Hierdie Konvensie dra die titel "Quo Vadis VMEQ?"

Die VMEQ bemoei hom met elektrisiteitsvoorsiening regoor die Republiek. Deur kragvoorsiening aan verbruikers in stede, dorpe en op hoewes en plaasgedeeltes, sowel as aan nywerhede, bedrywe, besighede, kerke, skole, ontspanningsoorde, vermaaklikheidsentrums, ens, het VMEQ-lede direk 'n invloed op die

bestaan van verbruikers oor die hele spektrum van die Suid-Afrikaanse lewenswyse. Deur die afwesigheid van kragvoorsiening aan onderontwikkelde gebiede vir byvoorbeeld afstandsondererrig en nuusdekking op televisie, beïnvloed die VMEQ die lewenswyse van die mense in daardie gebiede indirek.

Die VMEQ is dus funksioneel verbode aan feitlik al die mense van Suid-Afrika.

In die beantwoording van die vraag "Waarheen VMEQ?" moet ons noodwendig kennis neem van die antwoord op die vraag "Waarheen Suid-Afrika?" Ons moet dus weet wat is werklike behoeftes en die redelike wense van die gemeenskap wat ons dien en bedien.

#### APPROACH

Mr President, the approach which I have adopted in my contribution to the topic under discussion, was to consider the objectives of the AMEU, attempt to evaluate what has been achieved, what is the current situation, and to consider current and possible future developments.

As regards the objectives of the AMEU, I extracted the following from the Technical Secretary's article "The Present and Future Role of the AMEU in the supply of Electricity in South Africa" which appeared in the March/April 1989 issue of "Local Government", and I quote:

#### 'Objectives of the AMEU

To promote the interests of municipal electricity undertakings.

To collaborate with other technical bodies in the sphere of electricity distribution.

To foster the establishment of organisations outside the boundaries of South Africa having objectives similar to those of the AMEU.

To assist such organisations technically and financially in the field of the electricity supply industry.

To organise and participate in international meetings of organisations with objectives and functions similar to that of the AMEU.

To foster the exchange of information as far as the electricity supply industry as a whole is concerned.' Unquote.

I am afraid we do not have the time now to dwell on any of these aspects, but I will touch on some of the current issues and possible future developments which in my opinion may influence the AMEU and its members.

#### Some current issues

1. Relatively high dependence on imported technology especially more advanced technology.



Mnr Coen Scherman, Pretoria

2. Relatively high dependence on imports especially with respect to more sophisticated equipment.
3. An international strategy of sanctions and boycotts against the Republic.
4. Unfavourable political and economical climate.
5. National shortage of skilled and highly trained technical staff.
6. Increasing competition for available resources.
7. Increasing instability in labour market.
8. Strong national urge for privatisation.
9. Changes in the energy and electricity market place.
10. Greater consumer awareness and sensitivity in respect of the generation and supply of electricity.

In general I gather a rather volatile and uncertain climate with many, and some formidable challenges, not only to the Municipal Engineer, but to the AMEU and the country as a whole.

The question arises as to whether South Africa, and for that matter the AMEU, can meet these challenges. What is to be done, how best can it be done and when is it to be done?

I believe the members of the AMEU have the potential and the ability to meet the challenges facing them in a most satisfactory way. Possibly we may need better skills, expertise or perhaps finesse, and possibly we need a little better co-ordination or perhaps a little inspiration, but I am absolutely convinced that we can meet the challenges. I am also a firm believer in the Afrikaans saying "Waar 'n wil is, is 'n weg".

#### WAT MOET GEDOEN WORD OM DIE UITDAGINGS DIE HOOF TE BIED?

Na my mening is dit nodig dat, onder meer, die volgende sake dringend aandag moet geniet:

1. Organisasoriese opskerpings.
2. Onderrig, opleiding en selfs opvoeding van personeel.
3. Optimale benutting van beskikbare hulpbronne.
4. Professionalisme, betrokkenheid en bestuur.
5. Rasionalisering van vereistes vir elektrisiteitsvoorsiening.
6. Standaardisering van spesifikasies.
7. Standaardisering van toerusting.
8. Privatisering.

U sal opmerk dat, in die beantwoording van die vraag "Quo vadis", ek die saak baie wyer aansy as wat mnr Botes in sy referaat gedoen het. Eties is ek hierin waarskynlik verkeerd, maar ek is daarvan oortuig dat die VME0 by 'n waterskeiding gekom het en dat dit gaan om 'n saak wat belangrik genoeg is om etiket oorboord te mag gooi. Die landsyde uitdagings wat aan die elektrisiteitsvoorsieningsindustrie gestel word, en dus ook aan die VME0 en sy lede gestel word, verg van ons meer indringende aandag. Dit is regtig jammer dat ons so min tyd vir hierdie onderwerp op ons program beskikbaar het.

Ek sal egter poog om kortliks my siening oor die punte wat ek genoem het toe te lig.

#### ORGANISATORIESE OPSKERPING

Dit is heeltemal moontlik dat in die bestaan van 'n organisasie daar veranderinge en verwickelinge kan kom wat die funksionering en organisatoriese opset van daardie organisasie só raak dat dit hersien moet word. Sulke veranderinge kan interne of eksterne oorsake hê.

Ons is almal bewus van veranderings en verwickelings wat tans in Suid-Afrika voorkom. Ook in die elektrisiteitsvoorsieningsnywerheid is daar tans belangrike verwickelinge en veranderinge besig om te gebeur.

As deel van die elektrisiteitsvoorsieningsnywerheid moet die VME0 hom deeglik vergewis van die veranderinge en verwickelinge en hom daarby aanpas.

Tweedens is dit nodig vir die VME0, soos vir enige organisasie om hom gereed aan sy grondwet of konstitusie te toets om te bepaal of hy hom by sy missie en doelstellings hou.

Derdens is dit nodig dat die VME0, soos elke organisasie, hom gereed beskou in die spieël van koste-effektiwiteit.

In sy referaat het mnr Botes ingegaan op die nodigheid vir organisatoriese opskerpings by die VME0 en het hy voorstelle in dié verband gedoen. Op my beurt het ek redelik volledig my kommentaar en sienings daaroor gegee. (Sien Aanhangel A.) Dit sal hopelik in die Verhandelinge van die Konvensie gepubliseer word en ek gaan dit nie hier herhaal nie. Na my mening behoort die Uitvoerende Raad oor die meeste van die aangeleenthede te besin en te besluit. Slegs daardie sake wat ingevolge die Grondwet na die Konvensie verwys moet word, behoort onder verslag en aanbeveling van die Uitvoerende Raad te dien.

Organisasoriese opskerpings in elke individuele onderneming om tred te hou met die hedendaagse vereistes wat aan ondernemings, hulle Afdelingshoofde en personeel gestel word, is ewe belangrik. Die vereistes en omstandighede mag van dorp tot dorp en van stad tot stad verskil met die gevolg dat dit nie veel sin maak om hier in besonderhede in te gaan nie. Die vraag word nietemmin aan elke Elektrotegniese Stadsingenieur en elke Stadsselektisiteitsingenieur gestel of die organisatoriese opset in sy Afdeling of Departement ingestel is op optimale funksionering.

Ten opsigte van organisatoriese opskerpings kan die VME0 'n leidende rol speel deur werkwinkels in die verskillende takke te organiseer waarin byvoorbeeld die organisatoriese opset van verskillende grootte elektrisiteitsondernemings ontleed word en teenoor hulle prestasies evalueer word.

'n Ander moontlikheid is die evaluering van die organisasie van 'n Elektrotegniese Stadsingenieur deur twee of drie van sy eweknieë, die sogenaamde "peer review"-beginsel. Vir sommige van ons mag dit moontlik tydens die proses effens ongemaklik wees en selfs verleentheid skep, maar ek is daarvan oortuig dat die resultate vir ons almal uiteindeklyk leersaam, heilsaam en verrykend sal wees. Dit sal ons ook die nodige vertroue gee om met absolute vrymoedigheid en openlikheid met ons verbruikers en selfs ons kritici te kommunikeer.

#### OPLEIDING VAN PERSONEEL

Daar bestaan 'n groot behoefte aan toepaslike voortgesette tegniese opleiding vir alle tegniese personeel in al die range van elektrisiteitsondernemings om bestaande tegnologie te verstaan en aan te leer, om met nuwe tegnologie tred te hou en om 'n eie Suid-Afrikaanse tegnologie te ontwikkel en te vestig.

Ek is verheug oor die VME0 se siening en bydrae tot die daargestelling van 'n Opleidingsraad vir Plaaslike Owerhede en vertrou dat dit spoedig sal funksioneer. Die opleiding van personeel spesifiek vir die elektrisiteitsvoorsieningsbedryf is myns innsens van kardinale belang. Ek meen dat dit ook tyd geword het dat ons ondersoek doen na die daarstelling van opleidingsmodules vir nuwe ambagte soos byvoorbeeld:

Hoëspanningselektrisiteit  
Substasie-elektrisiteit  
Relëpaneelbedraeder  
Kraglykonstrukteur  
Kabelasser

Ons moet ons daarop toespits om alle geskikte tegniese personeel waaroor ons beskik tot die maksimum van elkeen se potensiaal te ontwikkel en op te lei. Dit geld regdeur vanaf die vakman-vlak, deur die bedryfsrange, tot op die professionele vlak.

Suid-Afrika beleef 'n tyd van ernstige tekorte aan hoogs opgeleide tegniese personeel, wat meebreng dat opgeleide tegniese personeel sterk in aanvraag is. Hierdie hoë aanvraag gee aanleiding tot 'n hoë mobiliteit onder tegniese personeel. Hoë mobiliteit mag 'n wyë ervaringsveld ten gevolg hê, maar lei beslis tot 'n vervlakking in ervaringsdiepte. Ons moet onthou dat personeelomset waar veral nuwe oernuwe personeel tot die diens toetree, 'n uitwassings-effek het, wat 'n vervlakking in die ervaringsdiepte van personeel ten gevolg het en op die lang duur uiters nadelig vir sulke ondernemings kan wees.

Omdat Plaaslike Owerhede nie sulke mededingende salarisse kan aanbied nie, word hulle meer veral personeel maklik deur aansloklike vergoedingspakette weggerokke deur firmas en instansies wat meer aantreklike pakette kan aanbied. (Is dit dalk moontlik omdat hulle nie soveel in opleiding belê het nie?) Die algemene aard van die akademiese opleiding van tegniese personeel maak dit moontlik vir sulke personeel wat ten duurste

deur plaaslike owerhede opgelei is om betreklik maklik in enige ander nywerheid of praktyk opgeneem te word. Het dit nie tyd geword dat plaaslike owerhede, en by name die VMEO, hom beywer vir opleiding wat meer toegesig is op die werksaamhede in die plaaslike owerheidswee nie? In hierdie verband het Pretoria al voorheen 'n pleidooi gelewer vir die instelling van 'n leerstoel in munisipale elektriese ingenieurswese!

Daar bestaan 'n dringende behoefte aan toepaslike bestuursopleiding vir personeel in die bestuursrang van elektrisiteits-ondernemings. Groter bestuursvernuw word van VMEO-lede vereis en lede moet hulle beywer vir bestuursontwikkeling om die nodige bestuurskundigheid te bekom.

In die eerste plek is dit die lid en sy werkgewer se verantwoordelikheid om opleidingsbehoefes te bevredig, maar deur die nodige leiding, advies en ondersteuning te gee, kan die VMEO sodanige aksies sinvol koördineer.

Na my mening kan die VMEO as organisasie veel doen om die behoeftes aan tegniese opleiding en bestuursontwikkeling by sy lede te bevredig. Die VMEO kan prakties meedoen aan die ontwikkeling van sy lede deur die aanbieding van geskikte referate en die reël van toepaslike seminare of werksinkels. In dié opsig wil ek by mnr Botes aansluit en sê dat na my beskeie mening daar baie ruimte is vir verbetering ter verwesentliking van ons doelstellings.

Die verantwoordelikheid lê egter ook by elke lid om sy deel by te dra tot sy eie ontwikkeling en dié van sy medeleders deur aktief, opbouend en daadwerklik aan die verrigtinge van die VMEO deel te neem.

Suid-Afrika beleef tans die era van ontwakning van Swart vakbonde en die woelinge wat daarmee saamgaan. Dit kan nie ontken word dat die optrede van party lede van sulke vakbonde en ook van sommige eerstelyntoetsinghouers tans nog veel te wense oorlaan nie. In hierdie sin sien ek dat VMEO-lede 'n groot opvoedingstaak het. Ons het ook 'n opvoedingstaak tans opsigte van groter veiligheidsbewustheid en verliesbeheer, veral by arbeiders in diens van plaaslike owerhede.

VMEO-lede kan ook 'n groot rol speel in die opleiding, opvoeding en ontwikkeling van die personeel van hulle Swart buurmunisipaliteite en van personeel in ander onderontwikkelde gebiede.

#### **OPTIMALE BENUTTING VAN BRONNE**

Die optimale benutting van beskikbare hulpbronne in enige organisasie is 'n basiese vereiste vir goeie bestuur. Veral ten opsigte van 'n hulpron wat skaars is soos in die geval van opgeleide en ervare mannekrag, is die optimale benutting van beskikbare personeel van kardinale belang.

Ek glo dat lede van die VMEO veel kan doen om halfgeskoolde personeel te benut om die tekorte aan ambagsmanne wat van tyd tot tyd voorkom te verlig. Geskikte praktiese opleiding en stabiliteit in daardie deel van die arbeidsmark is egter 'n voorvereiste.

Na my mening is daar ook ruimte vir die beter aanwending en toepaslike benutting van ingenieurs bygestaan deur ingenieurs-tegnoloë en ingenieurstechnici.

#### **PROFESSIONALISM, INVOLVEMENT AND MANAGEMENT**

As regards the proposed upliftment of the status of the municipal electrical engineer, I am of the opinion that status cannot be conferred on a person. As is the case with esteem, reverence and respect, status is something which must be earned, commanded or achieved through the integrity and quality of one's exemplary conduct. As engineers, I am of the opinion that our actions should in all respects truly bespeak accountability, responsibility, management skill and professionalism. Our reports, presentations and recommendations to Council should reflect well-considered, well-motivated and properly substantiated arguments, and matters should be set out in the correct perspective and with the necessary vision. Thus we shall be deserving of the esteem and status associated with the posts we hold.

Regrettably, South Africa has now entered the era of politi-

cised Local Government. We can therefore expect matters to be infested with party-political motivations. As Departmental Heads we may be confronted with situations and possible attempts to influence our ways of thinking in a particular direction. The challenge is ours to practise absolute integrity, to apply sound judgement and to base our recommendations and decisions purely on the merits of each case under consideration. After all, parties and governments may change from election to election, but as Engineers we remain accountable for our actions and the consequences of our decisions.

While there is a world-wide tendency to isolate and boycott South Africa, I believe the time has come for the AMEU to actively and vigorously strive to get associated with overseas organisations with similar objectives and to win friends and influence people to the benefit of South Africa. I am advocating global participation and affiliation to international organisations similar to the International Federation of Civil Town Engineers to which IMESA belongs.

I believe that the AMEU should be represented on national municipal bodies such as the United Municipal Executive and on provincial bodies such as the Transvaal Municipal Association and the other provincial municipal associations and their sub-committees. Since the electricity budget of an authority who supplies electricity constitutes a very large proportion of the total revenue budget of that authority, I believe that the lack of active participation by the AMEU on these bodies can no longer be afforded. I therefore appeal to the AMEU Executive Council to pursue this goal in every possible way.

AMEU members should also be involved in the top management of Local Authorities and shall aspire to the post of Town Clerk. The traditional way of thinking that the Town Clerk must come from the ranks of the legal profession is outdated. Whilst by-laws and regulations are essential for a well-ordered community, they are not drafted daily. Decisions regarding engineering services, on the other hand, virtually require his daily attention. Engineers are trained and experienced in this kind of decision-making and with suitable managerial training and perhaps a little exposure to the legal side of matters, should make ideal top executives.

Die vervulling van groot behoeftes aan die een kant met beperkte bronne aan die ander kant te midde van veranderende klimaat, regulering, omstandighede en gesindhede, kan alleen deur uiters knap bestuur vermag word met volle toewyding en algehele betrokkenheid deur die Ingenieur. Selfbestuur, ja al die fasette van bestuur in die onderneming, sal die volle aandag van die ingenieur en sy topbestuur vereis as hulle sukses wil behaal in die nuwe era wat ons reeds betree het.

#### **RASIONALISERING EN STANDAARDISERING T.O.V. KRAGVOORSIENING**

In die lig van die boikotte teen Suid-Afrika, die tekort aan opgeleide tegniese personeel en ander beperkinge, het dit sekerlik tyd geword dat alle bedrywe en nywerhede kyk na rasionalisering en standaardisering in die wydsye sin. Ek bepleit dit ook in die elektrisiteitsvoorsieningsbedryf en meen dat die volgende aksies geneem en bespoedig behoort te word:

Aanvaarding van een standaardspanning vir Ls-kragvoorsiening in Suid-Afrika en aktiewe bevordering daarvan.

Aanvaarding van gerasionaliseerde stelsel van spannings vir Hs-verspreiding regdeur Suid-Afrika.

Rasionalisering van vereistes vir kragvoorsieningstoerusting in die sin van standaard foutvlakke, ontwerp stroomdravermoëns, isolasiepele, toetsmetodes en toetskriteria.

Strewe na groter eenvormigheid ten opsigte van netwerkontwerpe met die oog op standaardisasie.

Rasionalisering van vereistes vir en standaardisering van spesifikasies vir kragvoorsieningstoerusting soos minibusstasies, verspreidingstransformators, Hs-skakeluitg, hoofring-eenhede, Ls-skakeluitg, pale, straatligte, kables, meters en ander algemene toerusting wat deur alle ondernemings gebruik word.

Daar dien hier gemeld te word dat die 5 groter munisipaliteite,

en as sodanig die VME0 saam met Eskom, al heelwat voor-  
dering gemaak het met 'n poging tot rasionalisasie in die elek-  
trisiteitsvoorsieningsbedryf. Ek verwys na die werk wat gedoen  
word deur die sogenaamde Elektrisiteitsvoorsieningskakekomi-  
tee ("Electricity Suppliers Liaison Committee"). Daar is reeds  
ver gevorder met byvoorbeeld riglynspeksifikasies vir ver-  
spreidingstransformators, minisubstasies, hoofringeenhede en  
Hs-skakeltraag.

#### PRIVATISERING

In ons land word daar vandag baie van en oor privatisering  
gepraat en gedink. Die Regering het reeds te kenne gegee dat  
Eskom geprivatiseer behoort te word en die ondersoek het al  
baie ver gevorder. Tydens die Tegniese Vergadering in Pot-  
chefstroom het die VME0 hom ook ten gunste van privatisering  
van munisipale elektrisiteitsondernemings uitgespreek en het  
Kempton Park die groenlig gekry om die moontlikheid verder  
te ondersoek.

Die Permanente Fiansiële Skakelkomitee het reeds Algemene  
Riglyne rakende die privatisering van aktiwiteite van Plaaslike  
Owerhede goedgekeur. Die VMB het 'n komitee vir die koördi-  
nering van privatisering deur Plaaslike Owerhede onder lei-  
ding van mnr Stanley Evans, Stadsklere van Kaapstad. Die  
komitee staan ook bekend as die Privatiseringskomitee.

Die wysigingswetsontwerp op die Bevordering van Plaaslike  
Besture wat die deur vir die stigting van maatskappye oopmaak  
met die oog op privatisering, geniet tans aandag.

Die vraag ontstaan of VME0-lede se motivering vir privatisering  
korrek is. Baie lede bepleit privatisering om uit te kom  
onder die groot aantal streng beperkinge wat deur statutêre regu-  
lering Plaaslike Owerhede ten laste gekê word. Hoewel ek meen  
dat ons hier te lande heeltemal oorgereguleer is, meen ek nie  
dit is 'n goeie rede om te privatiseer nie.

Aan die ander kant is een van die Regering se belangrikste  
motiverings vir privatisering die verkryging van inkomste uit  
belasting op die geprivatiseerde onderneming. Na my mening  
is Suid-Afrikaners ook oorbelas en daarom is ook hierdie  
motivering vir my 'n verkeerde een.

Privatisering behoort as grondslag te hê die optimale benutting  
van beskikbare hulpbronne om elektrisiteit koste-effektief  
beskikbaar te stel aan alle verbruikers wat dit verlang volgens  
die verbruiker se behoefte, met 'n billike wins vir die sukses-  
volle ondernemer.

Anders as by Yskor, die SAVD en ander staatskorporasies wat  
kandidate vir privatisering is, is Eskom nie die enigste voor-  
siener van krag nie. Kragvoorsiening is versprei oor 'n groot  
aantal ondernemings wat deur verskillende owerhede en instan-  
sies bedryf word. Die vraag ontstaan: "Kan kragvoorsiening  
deur Eskom afsonderlik van munisipaliteite geprivatiseer  
word?"

Ek meen die antwoord op hierdie vraag is negatief. As Eskom  
geprivatiseer word, sal hulle as 'n privaat-maatskappij mark-  
verwante dividende op hulle aandeelkapitaal en belasting op  
hulle wins moet betaal. Ek twyfel nie daaraan dat dit die prys  
van elektrisiteit gaan opjaag nie. As munisipaliteite wat self krag  
opwek toegelaat word om onder die huidige beleid voort te gaan  
met kragvoorsiening terwyl Eskom belasting moet betaal, kan  
dit neerkom op onregverdig mededinging. Om net eenvoudige  
munisipale kragvoorsiening te belas sonder om te dereguleer,  
sal ook op onregverdig mededinging neerkom. Daar sal myns  
insiens noodwendig gekyk moet word na die privatisering van  
elektrisiteitsvoorsiening as geheel.

Ten opsigte van die privatiseringsaksie rondom 'n gediver-  
sifiseerde bedryf, ontstaan die vraag: "Watter strategie sal ge-  
volg word?"

Een moontlike scenario kan soos volg verloop:

- Rasionalisering van stelsels, toerusting en ontwerpe deur  
samesamewerking op die tegniese bestuur- en bedryfsvlak. Om-  
dat die bedryf ook 'n groot aantal kleiner ondernemings  
insluit, mag dit wenslik wees om eers die groter onder-  
nemings in so 'n aksie te betrek en waarskynlik sal die kleiner  
ondernemings hulle voorbeeld volg. Dit is noodsaaklik vir

- 'n suksesvol geprivatiseerde onderneming dat daar nie ver-  
skille in filosofie, benadering en stelsels is wat op 'n ge-  
ografiese grondslag produktiwiteit nadelig kan beïnvloed nie.
- Standaardisering van spesifikasies, vereistes, stelselont-  
werpe, foutvlakke, spannings, leweringsvermoens ens-  
voorts. Ek het reeds vroeër na hierdie aksie verwys. Vir  
'n nasionale benadering is hierdie stap onontbeerlik.
- Samesprekings op beheer- en bestuursvlak met die oog op  
privatisering.
- Opleiding, ontwikkeling en optimisering van personeel.
- Opleiding en ontwikkeling van bestuurspersoneel in die be-  
oefde nuwe rol en spelreëls.
- Samesprekings met vakbonde en belanghebbendes oor en  
voorbereiding van personeel vir privatisering.
- Deregulering en herregulering vir privatisering.
- Die privatiseringsaksie self (stigting van maatskappij, ver-  
kryging van kapitaal, ens. ens.)

As die huidige VME0/Eskom-inisiatiewe baie ooreenstem met  
die eerste twee of drie fasette moet dit ons nistel nie, want  
selfs al sou ons nooit kragvoorsiening geprivatiseer nie, is en bly  
rasionalisering en standaardisering noodsaaklik vir doeltreffende  
en koste-effektiewe kragvoorsiening.

#### MOONTLIKE STATUTÊRE GESAG VIR DIE VME0?

Die VME0 is nie by wetgewing ingestel nie en beskik dus oor  
geen statutêre gesag nie. Lidmaatskap van die VME0 is vrywillig  
en die besluite van die VME0 is nie afdwingbaar nie. By ver-  
skeie informele gesprekke is die gebrek aan statutêre gesag van  
die VME0 al as 'n leemte gesien. Vrywillige konsensus is myns  
insiens van groter en blywender waarde as enige verpligting wat  
deur statutêre gesag afdwing word. Ek dink statutêre status  
sal ook die wonderlike gees van kameraadskap by die VME0  
ondermyn en op die lang duur net tot nadeel van die organisasie  
strek.

Indien daar op een of ander wyse statutêre gesag aan die VME0  
verleen kon en sou word, sou dit seker moontlik gewees het om  
bepaalde besluite konsekwent deur die bedryf uitgevoer te kry  
en sou daar moontlik groter eenvormigheid regdeur die munisi-  
pale kragvoorsieningsbedryf tot stand gebring gewees het, maar  
ek wonder of die heersende gees van kameradie en vriendskap  
nog daar sou gewees het.

#### MISSIE VAN DIE VME0?

Ek wil afsluit deur te sê dat die vraag "Quo Vadis VME0?"  
vir my sinoniem is met die vraag "Wat is die missie (roeping)  
van die VME0?" Myns insiens is sy missie die belangrikste fon-  
damenteelste van enige organisasie. In die VME0-grondwet vind  
ek lofwaaardige doelstellings, maar ek kan nie 'n formulering  
van ons missie vind nie. Het dit nie tyd geword dat ons as VME0  
ons missie formuleer en dit in ons grondwet opneem nie?

Dit het gebruiklik geword om 'n referent geluk te wens met sy  
referaat. Ek dink mnr Botes verdien lof vir sy waagmoedigheid  
om aktuele sake rondom die organisasie van die VME0 by 'n  
geleentheid soos hierdie aan te spreek en yeral omdat by ernstige  
kwelivrae met groot omsigtigheid en takt hanteer.

Die feit dat die VME0 by hierdie openbare forum ondersoekend  
na sy eie interne organisasie kyk, dui vir my daarop dat dit 'n  
kerngesonde organisasie is wat nie skroom om hand in eie boesem  
te steek nie. Die VME0 is bereid om sodanige verande-  
rings en aanpassings te maak as wat nodig is, en dit is prysens-  
waardig.

#### AANHANGSEL A

##### Die VME0 EN ORGANISATORIESE OPSKERPING

###### Samestelling van die Uitvoerende Raad

Mnr Botes wys in sy referaat op die waardevolle rol wat Stads-  
raadslede as verteenwoordigers van plaaslike regering gedurende  
die na-oorlogse jare gespeel het. Hoewel ek dit met hom eens  
is dat ervaring oor die jare heen getoon het dat enkele Stads-  
raadslede nie altyd ten volle by die aktiwiteite van die VME0  
ingeskakel het nie, meen ek dat die teenwoordigheid van Stads-  
raadslede op die Uitvoerende Raad van die VME0 vir ons

onontbeerlik is. As verteenwoordigers van Plaaslike Owerhede het hulle toegang tot tweede- en derdevlakregering, wat Stads- en Elektrisiteitsingenieurs nie het nie. Baie van hulle beklee posisies in die samelewing waar hulle weer met ander invloedryke persone kontak het en so kan hulle die belang van die VMEIO en elektrisiteitsvoorsiening in die algemeen sterk bevorder.

Ek steun mnr Botes se voorstel dat die VMEIO inspraak by die Sentrale Regering, Provinsiale owerhede en Streeksowerhede moet hê wanneer dit by wetgewing oor die regulering van die elektrisiteitsbedryf kom. Juis hierdie aspek versterk my argument dat Stadsraadslede op die VMEIO se Uitvoerende Raad moet dien. Ek glo egter dat ons as Ingenieurs wel in staat is om self die kundige advies en professionele leiding te gee wat as insette nodig is vir besluitneming deur bogenoemde instansies.

Nou wat nou gemaak met Stadsraadslede wat uit hoofde van die amp van hulle Stads- en Elektrisiteitsingenieurs verkies word tot die Uitvoerende Raad? So 'n outomatiese aanwysing is myns insiens nie korrek nie. Ek bepleit 'n stelsel waarvolgens Stadsraadslede op die Uitvoerende Raad verkies word op grond van meriete. Sodanige Raadslede moet werklik 'n belangstelling in elektrisiteitsvoorsiening hê en moet die doelstellings van die VMEIO volmondig onderskryf en aktief by die werksaamhede van die VMEIO betrokke wees.

Die voorstel dat die Stadsraadslede van die verkose President en Aangewese President ex officio-lede van die uitvoerende Raad moet wees, het bepaalde meriete, maar kan dieselfde probleme oplewer as wat tans in ander gevalle ervaar word.

Om die probleem van 'n groot lomp Uitvoerende Raad, met gepaardgaande hoë uitgawes ten opsigte van vergaderings, te oorkom, kan die aantal raadslede en dus ook die aantal Stadsraadslede wat op die Uitvoerende Raad dien, beperk word. Immers, selfs net twee of drie werklik ingeskakelde Stadsraadslede is vir die organisasie veel meer werd as baie lede wat nie regtig belang stel in die organisasie nie of selfs teësinning in die organisasie dien.

Ek verneem graag van mnr Botes of hy meen dat daar 'n stelsel uitgewerk kan word waarvolgens Stadsraadslede op grond van meriete tot die VMEIO se Uitvoerende Raad verkies kan word. Indien hy wel so 'n moontlikheid voorsien, wil ek voorstel dat die saak na die Uitvoerende Raad vir verdere oorweging verwys word.

#### Grootte van Uitvoerende Raad

Die voorstel van 'n Uitvoerende Raad van 12 lede met die reg om bykomende lede vir bepaalde doeleindes te koöpteer, skyn vir my billik te wees. 'n Raad van daardie grootte behoort redelik doeltreffend en doelmattig te funksioneer sonder dat individuele lede met werk oorlaai sal wees, mits elkeen sy deel doen. Ek steun dus die voorstel.

#### Ampstermyn van President van VMEIO

Dit is tans die gebruik dat daar elke tweede jaar 'n nuwe President verkies word. Met die huidige hoë administratiewe werksaamhede van die President is dit 'n praktiese reëling en waarskynlik noodsaaklik. Ek meen egter dat die President herverkiesbaar behoort te wees omdat 'n uitsonderlike persoon in daardie pos vir die VMEIO van onskatbare waarde kan wees. Dit is ook soms nie moontlik om langtermyn-strategieë in slegs een of twee jaar deurgevoer te kry nie. Mnr Botes se voorstelle vir veranderinge in die funksies van die Sekretariaat behoort die administratiewe en organiseringlas op die President aansienlik te verlig en dan behoort dit vir hom moontlik te wees om meer as een termyn te dien.

Ek verneem graag van mnr Botes of hy meen dat so 'n voorstel prakties uitvoerbaar sal wees onder die nuwe bedeling wat hy in gedagte het. Moontlik is daar ander vooramalige Presidentes wat ook op hierdie vraag sal wil reageer.

#### Die Dagbestuur

Ek is dit eens met mnr Botes dat die huidige skedulering van die Uitvoerende Raad se vergaderings meerming dat sake deur die Dagbestuur hanteer word wat na rege by die Uitvoerende Raad tuishoort. Myns insiens behoort die Dagbestuur net uit drie of vier ampsdraers te bestaan wat op 'n dag tot dag grond-

slag aandag aan uiters dringende sake gee. Hulle bevoegdhe en pligte behoort in die Grondwet vervat te wees.

#### Subkomitees van die Uitvoerende Raad

Ek aanvaar mnr Botes se stelling dat die subkomitees van die Uitvoerende Raad goed funksioneer. As reëlikte nuweling in die VMEIO is dit vir my nog 'n bietjie onduidelik hoe die verskillende komitees saamgestel is, wat presies elkeen se taakopdrag is en hoe en wanneer elkeen aan die Uitvoerende Raad verslag doen. Ek sou graag wou sien dat daar 'n prosedure bestaan waarvolgens elke subkomitee se bestaan, samestelling, funksionering en taakopdrag gereeld (sê jaarliks) herevaluer of hersien word. Is dit beleid dat elke subkomitee onder voorsitterskap van 'n Uitvoerende Raadslid funksioneer?

Die Elektrisiteitsvoorsieningskomitee van die VMEIO is in 'n sekere sin seker een van die belangrikste subkomitees en dit is daarom noodsaaklik dat die VMEIO-verteenwoordiger op die Elektrisiteitsraad in hierdie komitee dien. Mnr Botes meen die persoon moet verkieslik nie as Voorsitter dien nie maar hy gee nie verder motivering vir sy standpunt nie. As lid van die Elektrisiteitsraad is hy myns insiens in die beste posisie om leiding en rigting te gee aan die Elektrisiteitsvoorsieningskomitee en juis daarom behoort hy as voorsitter van die Elektrisiteitsvoorsieningskomitee op te tree.

#### Skedulering van Uitvoerende Raadsvergaderings

Ek is dit volkome eens met mnr Botes dat die huidige reëling van slegs twee Uitvoerende Raadsvergaderings per jaar nie beantwoord aan die Bestuursvereistes vir 'n dinamiese organisasie soos die VMEIO nie. Daar moet ten minste vier vergaderings per jaar wees. Die belangrikste jaarlikse Uitvoerende Raadsvergadering moet sekerlik die vergadering kort voor die jaarlikse konsensie of tegniese vergadering wees waar die doelwitte en strategie vir die komende byeenkoms bespreek en geformuleer moet word.

Dit is ook die vergadering waar die verskillende Raadslede verslag behoort te doen oor die voorafgaande jaar se werksaamhede van hulle onderskeie subkomitees.

#### Sekretariaat

Vir 'n dinamiese nasionale organisasie soos die VMEIO wat oor die hele Republiek versprei is en wat op internasionale vlakke met ander soortgelyke organisasies skakel, is 'n voortrefflike en professionele sekretariaat wat behoortlik en funksioneel goed toegerus is, onontbeerlik. Vinnige, doeltreffende en effektiewe kommunikasie is een van die belangrikste bestuursfaktore in 'n suksesvolle organisasie.

Die punte wat mnr Botes oor die Sekretariaat aanhaal, is sekerlik geldig en toepaslik, maar ek meen dat die vereistes wat aan die Sekretariaat gestel word, nog meer omvattend is.

Ek is dit ook eens met mnr Botes dat daar 'n wesentlike behoefte aan beter en vinniger kommunikasie tussen die Uitvoerende Raad, sy komitees, VMEIO-takke en Sekretarisse bestaan. Daar bestaan ook 'n groot leemte wat kommunikasie tussen takke onderling betref. Ons leef in 'n tydperk waar goeie kommunikasie werklik 'n fondamentsteen vir suksesvolle werking van elke organisasie is en die tegniese hulpmiddele om baie vinnig te kan kommunikeer is tot ons beskikking.

Ek verneem graag van mnr Botes of hy meen dat 'n inhuise Sekretariaat, wat in nouer kontak met die President funksioneer, moontlik meer organiseringsfunksies sal kan behartig en so doende die administratiewe las op die President en ander ampsdraers sal kan verlig.

Enkele gedagtes oor hoe die funksionering van die huidige Sekretariaat en wisselwerking met die Uitvoerende Raad en takke van die VMEIO moontlik verbeter kan word, is die volgende:

#### Voorstelle vir oorweging deur Uitvoerende Raad vir vaartbelyning en doeltreffende werksywes

1. Sake word by wyse van verslag of memoranda met 'n behoorlik geformuleerde aanbeveling aan die Uitvoerende Raad voorgelê (soos in die geval is met sake wat aan 'n Plaaslike Bestuur voorgelê word).
2. Mosies wat vir oorweging voorgelê word, word skriftelik voorgelê met die nodige motivering.

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3. Alle sake en mosies wat by 'n vergadering dien, word ingebind in die agenda wat saam met die kennisgewing van die betrokke vergadering aan die Uitvoerende Raadslede gestuur word. Dit sal aan elke Raadslid die geleentheid gee om elke saak of mosie vooraf te bestudeer en indien by verdere inligting verlang, dit te verkry of om vrae of onduidelikhede vooraf uit te klaar. Indien 'n Raadslid sterk teen 'n saak gekant sou wees, gee dit hom ook die geleentheid om sy saak voor te berei of om 'n geskikte amendement voor te berei.

Die voorgestelde werkswyse behoort in die praktyk baie onnodige besprekings in die vergadering uit te skakel wat tyd-besparend is en so bydra tot 'n meer effektiewe vergadering.

4. Raadsbesluite behoort genommener te word om maklike verwysing te bewerkstellig. Gestel by die Uitvoerende Raadsvergadering wat op 25 September 1989 gehou is, is daar 17 items oorweeg en ten opsigte van die laaste item is daar drie besluite geneem. Die verwysing na die tweede besluit onder item 17 kan soos volg genommener word:

VME0/UR/89-09-25/17.B

Indien die besluit byvoorbeeld deur die Hoëveldtak geneem is, kan dit soos volg genommener word:

VME0/HT/89-09-25/17.B

5. Die notules van die Uitvoerende Raad moet die volledige verslae of memoranda of motiverings ten opsigte van sake en mosies waarop besluit is, bevat soos onder 3 hierbo bepleit. Kommunikasie met takke sal daardeur verbeter word, want deur die volledige notule aan elke Takvoorsitter/Sekretaris te stuur is hulle ingelig oor die hele aanloop wat tot 'n bepaalde besluit gelei het.
6. Oorweging kan geskenk word aan die opstel van 'n reglement van orde vir vergaderings.

### Funksionering van die President en Aangewese President

Ek steun die gedagtes wat mnr Botes onder hierdie item uitspreek volmondig en kan nie in hierdie stadium daar iets byvoeg nie.

### Rekenariserig en databasis vir die VME0

Eweneens is dit belangrik dat inligting oor ondernemings wat lede deurgêe betroubaar en korrek moet wees.

Ons leef in die inligtingseu en die wyse waarop ons data en inligting hanteer, behoort daarby aan te pas. Ek bepleit 'n rekenaargesteurde inligtingstelsel vir die VME0 met 'n uitgebreide databasis waarin volle besonderhede van lede en hulle ondernemings opgeneem is. Die databasis moet ook volledige inligting oor referate, publikasies en navorsing oor tegniese probleme en oplossings bevat wat voor die VME0 gedien het. Verwysings na ander databasiese in die land sê byvoorbeeld oor elektrisiteitstariewe of bestuurswese of wat ook al, is onontbeerlik.

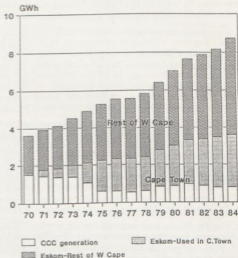
### MR C T GAUNT: AFFILIATE

Mr President, Gentlemen, thank you for the opportunity to contribute to Mr Botes' paper on the future of electricity undertakings and the AMEU. His forecasts will assist many delegates in the better planning of their organisations.

But, before looking into the future, let us glance back at a trend illustrated in this graph, Figure A. It is compiled from the Annual Reports of the Cape Town City Council and Eskom, and shows the electricity supplied in the Western Cape for the period 1970 to 1984.

The growth in energy consumption inside Cape Town and in the rest of the Western Cape have followed similar patterns. But, at the beginning of the period the City Council generated most of its own requirements; by 1984 most of the energy needed in Cape Town was being purchased from Eskom.

There are several reasons for the change. The high cost of oil for Table Bay power station, restrictions imposed on the expansion of municipal generating capacity, the lower operating cost of the country's newer power stations — all contributed to reducing the share of energy generated by the Council for use in its own area.



Eskom data not available after 1984

## Key activities of electricity undertakings

### Was: Generation

Generation capacity planning.

Negotiation of fuel supply contracts.

Maintenance of rotating machines.

Distribution to consumers.

### Now: Distribution

Optimising capital investment and losses and meeting consumers' needs.

Load control - peak lopping by pumped storage generation or load disconnection or better consumer mix.

Tariff manipulation - using different rates and benefitting from diversity.



Mr Trevor Gaunt

The same conditions have affected other municipalities in similar ways. Some which used to supply all their own energy no longer generate any.

The trend illustrated over this short period of 15 years in Cape Town is only part of a more general change in supply undertakings throughout South Africa. Ever since the AMEU was formed there has been a steady decrease in the proportion of generating municipalities and in the share that their generation contributed. Whether this is good or bad is a value judgement most of us are not in a position to make. But the trend has changed the character of the undertakings. Has their response been appropriate?

The role of the typical electricity undertaking has changed from being a generating undertaking to being a distributor. The changes in the undertakings' key activities are illustrated in Figure B.

With increasing emphasis on distribution one would expect that Councils would seek greater efficiency in this function, by internal or external specialisation and suitable organisation structures. Instead, there appears to be a trend to forming many small undertakings, not all municipal, in which the administrative burden is high in proportion to the engineering activity and the benefits of specialisation are often not sought.

Mr Botes, are these trends in the structure of undertakings — and are they desirable? You have proposed some changes to the organisation of the AMEU; but, at present, AMEU does not formulate policy for its members. In what other ways can Councils and AMEU members respond to their changing role, to meet the needs of their constituents and consumers and of the country as a whole?

#### **MNR J G MALAN: KEMPTON PARK**

Mnr die President, ek het altyd gewet Piet Botes is 'n slim man, maar nou weet ek dat hy ook 'n brawe man is.

Ek wil my dank uitspreek teenoor mnr Botes dat hy ons frustrasies met die rekenkundige deel van ons besigheid op so 'n ordentlike manier verwoerd het. Mnr Botes spreek die kern van die probleem aan wanneer hy sê: "Betekenisvolle produktiviteitsyfers kan verkry word waar die verantwoordelikhede vir en beheer oor die in- en uitsette in een departement gesetel is."

Die elektriese ingenieur word tot verantwoording geroep vir die betsuur van die totale elektrisiteitsonderneming terwyl hy slegs beheer kan uitoefen oor sy uitgawes en terwyl die invordering van sy inkomste deur andere beheer word. Die elektrisiteitsonderneming is gewoonlik een van die grootste besighede in die dorp of stad en dit is sekerlik die enigste waar die bestuurder nie beheer het oor beide inkomste en uitgawe nie. Besighedsbeginsels skitter in hulle afwesigheid, tot nadeel van ons gemeenskappe.

Indien QUO VADIS beantwoord kan word met 'n doelgerigte strewing na die implementering en toepassing van meer besighedsbeginsels in ons bedryf, dan het ons met hierdie poging 'n groot stap vorentoe geneem, tot voordeel van ons gemeenskappe.

#### **MNR J R VAN DEVENTER: ESKOM**

Eerstens my hartlike dank aan u, mnr die President, vir die geleentheid om 'n bydrae te maak tot die debat oor hierdie uiters belangrike onderwerp. Eintlik behoort die hele konvensie aan hierdie onderwerp gewy te gewees het, of minstens 'n volle dag.

Dan ook my dank aan mnr Botes wat so 'n belangrike onderwerp aan die orde gestel het.

Ek is van mening dat 'n mens eers oor die toekoms van die VMEC kan besin nadat oor die toekoms van die Munisipale Elektrisiteitsondernemings besin is. En daaroor kan eers gesels word nadat oor die toekoms van die hele Elektrisiteitsvoorsieningsnywerheid besin is.

Almal wat vandag hier bymeekaar is — Ondernemings, voorsieners, konsultante en Eskom het darem gelukkig 'n samebindende missie, naamlik om die Republiek van Suid-Afrika van voldoende elektriese energie te voorsien om die lewensgehalte

van al die inwoners te verbeter. As ons egter na die huidige situasie in meer besonderhede kyk begin die rooi ligte flikker.

Daar is naamlik tans ongeveer 500 Munisipale Elektrisiteitsondernemings en andere wat die energie-mark bedien. Dan is daar ook nog Eskom se twaalf Streke. Hierdie "ondernemings" bedien ongeveer 2,5 miljoen toevoerpunte, wat 27% van die energiemark uitmaak. Munisipaliteite voorsien ongeveer 2 miljoen klanteunte en 40% van die elektriese energie. Na raming is ongeveer 100 000 mense in die Elektrisiteitsvoorsieningsbedryf werksaam.

Daarby moet egter in gedagte gehou word dat daar ook 22 miljoen mense is wat nog nie toegang tot elektrisiteit in hulle huise het nie. Dit verteenwoordig 'n verdere 2,5 miljoen voorsieningspunte.

Die vrae is nou:

- \*Moet daar nog 500 Munisipale Elektrisiteitsondernemings gestig word?
- \*Moet daar nog 100 000 mense in diens geneem word?
- \*Waar gaan die kundigheid en opleiding vandaan kom?
- \*Waar gaan die beraamde R8 000 miljoen wat nodig is vandaan kom?

Laastens moet kennis geneem word van die volgende kragte wat reeds op die Elektrisiteitsvoorsieningsbedryf inwerk.

- \*Die dwang tot optimale benutting van skaars hulpbronne
- \*Die dwang tot privatisering uit owerheid uit
- \*Die devolusie van mag na derde vlak owerhede
- \*Steeds toenemende klante vereistes
- \*Die imperatief om die prys van elektrisiteit te verlaag om dit vir meer mense bekostigbaar te maak
- \*Die toenemende behoefte aan elektrisiteit

Die vraag ontstaan dus: Hoe gaan ons die toekoms hanteer?

Twee antwoorde op dié vraag is pertinent aan die hand van die referaat wat onder bespreking is.

Eerstens, het die hele industrie 'n visie nodig waarheen gestrewe word, iets soos

"Elektrisiteit vir alle mense en alle prosesse teen prys wat hulle kan bekostig".

Tweedens, behoort die industrie 'n fundamentele rasionaliserende herstrukturering te ondergaan wat die volgende vereistes sal bevredig:

- \*Dit moet die markgedreweheid en klantgerigtheid finaal in bed in die besighedspraktijk van die industrie.
- \*Elektrisiteit moet op besighedsgrondslag voorsien word.
- \*Die voorsiening van elektrisiteit aan eindverbruikers moet nie elektriese departemente of "ondernemings" wees nie, maar volwaardige besighede, onder leiding van besighedsbestuurders.
- \*Daar moet 'n optimale aantal sodanige besighede bestaan, wat elkeen sy deel van die energiemark op ekonomies lewensvatbare wyse bedien. Moontlik nie meer as so 70 sodanige besighede nie. (Groot kragstasies uitsluit.)

Hierdie nuwe "Bemarkings en Distribusie" sektor van die bedryf kan groot gedeeltes van die huidige Eskom-streke insluit en ook die bestaande Munisipale Elektrisiteitsondernemings.

#### **AFSLUITING**

Teen bogaande agtergrond kan die vraag van Quo Vadis? nou beantwoord word.

- \*Die bestaande tegniese forums soos die S.A. Instituut van Elektriese Ingenieurs is voldoende om as forum te dien vir tegniese gesprekke.
- \*Wat nodig is, is 'n besighedsforum, 'n soort "besigheds-assosiasie" waar Elektrisiteits-sake manne saam kan besin oor sakekwessies soos bemarking, finansiële bestuur, wetgewing, personeelontwikkeling, bedinging, ens.

Dit is belangrik dat die gesprek wat vandag hier plaasgevind het voortgesit word tot 'n nuwe struktuur vir die bedryf geïmplementeer is.

## MR R A LEIGH: JOHANNESBURG

For the past 15 years I have concerned myself with the status of Engineers, it has been my privilege to have been associated with EASA, PE Joint Council, SACPE and its PAC and to fill an office in the SAIEE. I can understand and sympathise with Municipal Electrical Engineers. (After all that is what I am). I want to assure engineers present today that the frustration they feel is not confined to Municipal Electrical Engineers alone, that we must do all in our power to address the issue I agree.

However having seen so many mistakes made I am very clear in my mind that certain propositions won't bear the results desired. Any proposals which recommend further splinter groups will be counterproductive. Rather the reverse, and organisations such as the Institute of Certificated Engineers should consider joining up with the larger Institutes or Societies.

The present umbrella body Suid-Afrikaanse Vereniging vir Ingenieurswese (SAVI) has been a great step forward and the formation of Society of Professional Engineers (SPE) is now fact. EASA has disbanded and the Society's of the Technologists, Technicians and Certificated Engineers is awaited.

I urge municipal Electrical Engineers to consider the formation of interest groups within one or more of these societies or Institutes who will look after our general and technical interests.

If the word "Institute" is so desirable then Institute of Municipal Electricity Undertaking not Engineers should be used. AMEU or IMEU should then devote itself to affairs of our Undertakings as such.

The status of its Engineer members should be pursued inside the existing and proposed societies. I certainly agree with Mr Scherman's ideas on status.

Any formation of an Institute of Municipal Electrical Engineers of ± 500 members will not achieve status for itself but be regarded by our other colleagues as a small restricted and possibly inferior Organisation.

I can speak for SAIEE as I did yesterday and I invite a Sub-Group or interest group for Municipal Electrical Engineers within the SAIEE which could materially advance our technical interests and professional welfare.

If one examines the present growing scarcity of engineers entering municipal service one further realises a narrow approach will make our service less attractive to young men.

I agree one of the real problems facing recruitment is the Town Clerk's Remuneration Board.

The setting of engineer's salaries in Municipal Service at 58% of those paid in consultancy must give inevitable results. Refer to a recent publication by Prof A. Walker on Electrical Engineers salaries in the 30 to 40 age group and see who is paid the lowest salary package. Johannesburg is presently 48% short of Engineers, a position which worsens monthly. I believe only an influential and widely respected organisation can effectively represent us and we must therefore play a major role within those societies.

## MNR JOHANNES VENTER: TEMBISA

Mnr die President, ek wil u vriendelik bedank vir die geleentheid wat aan my gebied word om 'n bydrae tot hierdie konvensie te maak. Die bydrae pas aan by die referaat wat gelewer is.

In die kommentaar wat mnr J Loubser van Benoni oor die referaat gelewer het, het mnr Loubser die moontlikheid genoem van die daarstelling van byvoorbeeld 'n Oos-Rand Elektriesiteitsvoorsieningsraad. Hierdie denkrigting wil ek baie sterk steun en ek sal graag 'n motivering daarvoor gee.

Die swart (en anderskleurige) woongebiede in hierdie land, het te doen met probleme wat in die meeste blanke plaaslike owerhede geen probleme is nie. Die grootste en basiese probleme is personeel en die gepaardgaande kundigheid.

Graag wil ek Soweto 'n voorbeeld gebruik — en my apologie aan Eskom wat in hierdie stadium 'n ernstige poging aanwend om die probleme van hierdie stad op te los.

Soweto het nagenoeg 80 000 woonhuise wat met elektrisiteit

voorsien word. Vir lang tydperke het hierdie stad die kundigheid van twee (en hoogstens drie by tye) elektriese ingenieurs tot sy beskikking gehad.

Meeste van die ander nie-blanke plaaslike owerhede met tot 30 000 woonhuise, het nie die luuksheid van 'n elektriese ingenieur nie.

Die res van die personeelstruktuur in die meeste van hierdie woongebiede is so gehandvat dat dit slegs met baie moeite en opleiding as 'n basis gebruik kan word vir die opbouing van die elektriese departemente.

Om die lewenstandaard van die nie-blanke mense van hierdie land te verhoog en om die probleme aangaande die invordering van uitstaande skuld op te los, is dit dus dringend noodsaaklik dat 'n vereniging soos die VMEOM onmiddellik, baie dringende aandag aan die verskaffing van elektrisiteit aan hierdie woongebiede gee.

Soos wat bekend is, is die meeste van die groter swart woongebiede in die land, of geëlektrifiseer, of is in die proses om geëlektrifiseer te word.

Dit is egter 'n ontsettende skade wat die ekonomie van die land aangedoen word wanneer miljoene rande se toerusting geïnstalleer word in hierdie woongebiede, en die kundigheid en mannekrag om die instandhouding en die onderhoudswerk op hierdie toerusting te verrig, bestaan nie.

Ek doen dus 'n beroep op die VMEOM, om in die belang van hierdie land, dringende aandag aan hierdie probleme te gee.

Mr President, then I appeal to my colleagues, to my municipal colleagues, why must the electrical engineer take his hat in his hand when the AMEU decides that they will send an electrical engineer overseas to acquire that specific knowledge needed in South Africa.

Meneer die President, asseblief, neem kennis hiervan. U as Raadslede sien dat u op u begroting voorsiening maak as van ons elektriese ingenieurs oorsê moet gaan en dat hierdie Vereniging nie moet begroot daarvoor nie en dat ons begroot daarvoor. Die kennis wat hulle terugbring vanaf oorsê word gedeel deur elke persoon in hierdie land, dit word gedeel deur elke belastingbetaler om tariewe af te bring en kennis is krag. Mnr die President, baie dankie.

## CLR F VAN DER VELDE: CAPE TOWN

Mr President I would like to challenge this preoccupation about status. I find this in every walk of life that people start worrying about their status, they should actually look to themselves and wonder what's wrong with themselves if they need to. I take what Coen Scherman said in effect that status in fact must be earned. I see the Association of Municipal Electricity Undertakings as a body of mutual benefit that has got together and does get together and exchange ideas and technologies, it has a collective bargaining power with bodies such as Eskom, SABS etc, it maintains standards for the productive supply of electricity, for the safe supply of electricity and it sees to the training of staff and technologists and it continues to probe policies as it is doing now. I don't believe we need status. I believe our status is in our own efficiency, our own excellence and I would like to say, Mr President, in the ten years that I've been associated with the AMEU, I have found that excellence. I have found in Congresses, I have found in Executive Council meetings that in fact these things that I have outlined, do happen. That doesn't mean to say we mustn't examine ourselves and see whether there are new directions and policies we can take but for heaven's sake, let's get rid of this debate about status. Status such as trade unions are for the weak and not for the strong. Mr President in the above regard, I have found that the AMEU in getting together with engineers with suppliers of equipment and technologies and with the consumers as represented by Council members are all mutually benefited and are correct as such and that is really my only reply to Piet Botes' point about "should we get rid of Councillors from the Executive council". I'm not holding a candle for Councillors but I believe the various parts of the AMEU are in fact its strength.

I would like to change the subject and slightly emphasise Trevor Gaunt's point and question whether it's truly economical for



us to have 5 - 10 and maybe more future supply authorities in the greater Cape Town. Is this the direction in which we should be going? I don't think so. I believe it is negative economies of scale and I would like to see that point debated by a body such as the AMEU because I believe that it is us that should be setting a policy and should be advising smaller municipalities if they are really going to hatch this golden egg by having smaller and more and more local electricity supply authorities. Thank you.

#### **MNR HENRY BARNARD: GEAFFILIEERDE**

Meneer die President, hierdie Raadslede het so lank gepraat en alles gesê wat daar te sê was nou het ek niks om te sê nie. Ek dink u gaan baie bly wees daarvoor want die tyd is amper om. In die eerste plek laat my net eers toe, ek het u reeds gelukkigs, wens, om ons nuwe ingenieur van Brakpan, mnr Eddie Chapman, geluk te wens met sy aanstelling. Hy is ongelukkig in die onbendenswaardige posisie waar sy Stadsklerk nou die vorige Elektrotegniese Ingenieur was en een van sy Raadslede was ook 'n vorige Elektrotegniese Ingenieur, so hy het nie lekker "job" nie.

Dan wil ek vir u vra om my toe te laat om vir Piet Botes, soos ons hom almal ken, en soos ek hom altyd genoem het, die "bull in the china shop", baie geluk te wens met weers eens, hierdie keer, "n olifant in die china shop". Piet, hierdie referaat wat jy geskryf het was baie lankal nodig. Piet het nog altyd sy sê gesê, hy het nog altyd van die geleentheid gebruik gemaak om dinge kaalkop aan te pak en ek hoop dit gaan die mense laat regop sit oor wat hy hier gesê het. Ek gaan nie te veel uitbrei nie. Ek voel die eerste ding waarna hy verwys het is die bestuursgerigte, opleidingsbehoefes op bestuursvlak. Ek voel daar behoort êrens 'n kursus in die opleidingsrigting van die ingenieurs ingestel te word wat voorsiening maak vir bestuur asook finansies, want dit vorm 'n baie groot deel van die ingenieur se daaglikse taak. Om die waarheid te sê ek skat dat die meeste elektrotegniese ingenieurs ongeveer 90% van hulle tyd gebruik om bestuurswerk en finansiële werk te doen en slegs 10% van hulle tyd tegniese gebruik. Ongelukkig en Pieter het dit later ook genoem dat die Stadsvaders baie gelukkig sal wees as daar miskien 'n bestuurder aan die Hoof van 'n Departement staan. Nie noodwendig die ingenieur nie, en nie dat die ingenieur nou die mindere moet wees van daardie Departement nie, maar dat die bestuurder slegs die bestuurwerk doen en dat die ingenieur die ingenieurswerk doen. In 'n groot mate gaan dit ook die oplossing wees vir die tekort aan ingenieurs. U weet die ingenieur word ongelukkig baie verkeerd gebruik. Ons het ook die situasie dat in 'n klein plek daar tot vyf ingenieurs is om 'n Departement vlot te laat loop.

Ek verwys hier na 'n ander Departement as ons huidige Elektriese departement maar die punt wat ek wil maak is, het ons nie te veel "chiefs" en te min "indiens" nie? Is dit nie oorlaai by die kop nie? As jy kyk na die privaatsektor, waar ons so maklik 'n vergelyking mee maak, sit u met die situasie dat die ingenieur, en ek verwys miskien na konsultant ingenieurs, gewelddige somme geld per kop hanteer en vergelyking met wat in 'n munisipaliteit gebeur. Is dit dalk so dat die werk wat daardie ingenieur doen in die munisipaliteit baie minder is as die wat hulle in die privaatsektor doen? Daarom wil ek graag vra ons moet nie so maklik met die privaatsektor vergelyk nie veral wanneer dit kom by salarisse. Kom ons vergelyk onself met wat ons verdien en werk dan vorentoe. Ons vorige spreker het net nou gesê ons moet nie ander mense gebruik om ons vorentoe te vat nie, kom ons staan op ons eie voete.

Wat die status aanbetref, daaraan het die mense reeds goed gepraat. Ek hou van u idee, om die waarheid te sê, ek hou van al Piet se idees, hy het baie goeie idees maar ek hou nie van die idee dat hy die Raadslid heftelmatig wil uitsluit nie. Ek sal in die eerste plek by die huis moet bly maar al die jare is dit een kongres wat ek graag bygewoon het. Ek stem met hom saam dat 'n mens miskien die Raadslede moet gebruik wat vir jou meer van nut kan wees maar soos 'n Raadslid ook gesê het, jy sit met ander Raadslede wat in alle opsigte in elk geval die beleidbepalers in jou Raad is. Nou as jy kyk na die samestelling van jou Raad, daar is mense van verskillende oorsprong maar uiteindelik kom hulle by 'n situasie waar hulle ook 'n bydrae kan lewer in 'n Raad en ek dink dieselfde kan gebeur

op 'n Komitee soos hierdie waar die Raadslid tog uiteindelik sy bydrae nuttig kan aanwend.

Ek dink ons geaffilieerdes is noodsaaklik om so 'n groot sukses te maak van hierdie VMEQ se funksies en ook hulle bydraes tot die elektriese verspreidings, netwerke en dié tipe dinge. Ek hou van Piet se stelling dat die elektrotegniese ingenieur weer 'n "slenter gewerk" het. Dit is partykeer so omdat hulle met duistere dinge werk wat niemand kan verstaan nie en dit so dat die Raadslede gewoonlik bekommerd is dat die ingenieurs 'n slenter werk omdat hulle nie veel verstaan daarvan nie. Dit gaan gewoonlik daarvoor dat wat 'n mens iets van verstaan kan jy oorsies, hetsy dit by 'n Raadsvergadering of waarvan al is. Piet neem hier dat indien die munisipale sektor homself nie regkruis nie, sal die skaarste aan elektrotegniese ingenieurs al groter word. Ek het dit reeds gedek deur te sê dat ons miskien te veel ingenieurs gebruik waar ons met mense kan wegkom met minder kwalifikasies as 'n ingenieur, om die ingenieur behulpsaam te wees, soos wat die professionele ingenieurs dit in elk geval van die begin af beoog het. Mnr die President, ek wil vir u sê, baie dankie vir die geleentheid en ek wil weer vir Piet sê, baie geluk en ek dink jy het baie mense aan die dink gesit en ek hoop dit gaan nie net by dink bly nie, maar dat hulle gaan gebruik maak van die referaat wat jy gelewer het. Voordat ek afsluit, Meneer die President, die gedagte wat Raadslid Kotze uitgespreek het dat ons voorsiening moet maak dat ingenieurs opgelei word hetsy plaaslik of oorsse of waar ook al. Dan moet ons verseker wees dat ondervinding wat ingenieurs opdoen nie in isolasie gebruik word nie, maar dat dit beskikbaar gestel word aan al die munisipaliteite in die land. Dit gebeur dikwels dat een of twee ingenieurs op 'n oorsese besoek gaan en hulle doen geweldig baie kennis op soos Piet en Max Clarke nou gedoen het. Die volgende oomblik kom hulle terug en tree hulle uit die opbare lewe of hulle gebruik dit net vir hulle eie plaaslike doeleindes in isolasie. Ek voel hierdie mense moet die inligting op 'n baie wye basis versprei en miskien behoort daar 'n spesiale byeenkoms van die VMEQ-vergadering te wees waar hierdie mense dan hulle kennis wat hulle opgedoen het kan oordra. Ek wil vra dat mense soos Piet wat nou dreig om volgende jaar uit te tree, dit nie doen nie, maar dat hy op een of ander wyse die gewelddige kennis wat hy gedurende die jare wat verby is, opgedoen het aan die Vereniging of aan sy Raad oordra.

#### **MNR P J BOTES: ROODEPOORT**

Meneer die President, u het gesê ek moet gou maak so ek gaan baie vinnig wees. Mnr Louser baie dankie vir jou woorde. Ek wil net noem dat die rompslomp van personeelsake baie blitsiger gedoen kan word deur die Elektrisiteitsdepartement waar jy self oor die jare al die kennis het en jy baie vinniger kan afhandel as 'n ander departement vir wie jy moet smeek om dinge goedgekeur te kry. Ek kan dit baie vinniger doen. Binne 'n paar dae waar ek by te maande moet wag voordat daar van Pretoria af gehoor is of 'n sekere persoon se aansoek om hoër status of waar meer take aan hom toegeken is, goedgekeur kaffi word al dan nie. Ek sê nie 'n mens moet die Elektrisiteitsdepartement privatiser nie. Ek dink daar moet 'n verandering van die hele bestuurstelsel van elektrisiteitsondernemings plaasvind.

Dit kan dalk wees dat 'n klomp oud-Presidente die hele Uitvoerende raad oorheers. Ek weet van instansies waar dit wel in die verlede plaasgevind het. Ek sê nie ons moet dit nou stopsit nie maar ek vra net die vraag, en ek los dit daarby. Coen het 'n paar vrae gevra en ek stem saam met hom, ek dink die missie van die VMEQ behoort duidelik omskryf te word, dit is baie noodsaaklik.

Mr Gaunt, the role of the typical municipal electricity supply authority may yet change again. As you know Eskom may be privatised and once it's privatised I think its just right that other large undertakings should also be privatised with the chance to build power stations again but I share your views that there is too much fragmentation of smaller undertakings but this I feel is a different task which should be discussed at a later stage. I'd love a forum as each area may differ from the other.

Mnr Malan, baie dankie dat u saamstem met ek daar gesê het.

Mr Leigh, consumers off-peak tariff. I wonder whether people

know about the off-peak tariff, I'm just asking the question. One should educate these people. In the case of Roodepoot, I'm not talking about tariffs, but I built an overhead line right through the city of Roodepoot just recently as you all know. This is a very painful task to do and by canvassing and talking to people, I saw every person near that overhead line, I discussed it with them and I had wonderful results. I sincerely believe that one should canvas and know your consumers much better. You should have very close co-operation with your consumers and consult with them when you want to build an overhead line or want to introduce some new tariff. You should consult them on a basis where they can trust you and you can trust them and that's very important and that's the message that I want to bring forward, thank you.

Then Mr Jaap van Deventer, yes I think one can think about that. The only comment I want to make is that I think that Eskom should also break up and be part of those 70 areas. I think

it is unhealthy that Eskom should be privatised as a whole. It's my personal view.

Mr Van der Velde, the pre-occupation about status. When I talk about status here I mean the status of the AMEU and as you all know there are certain instances and even in Government circles that they do not know who the AMEU is and that is what I meant. I mean that we are bringing over an important message and we can bring over an important message about the electrical industry and yet nobody wants to discuss it with us or take us into consideration and that is what I meant as far as I am concerned, with status of the AMEU, that was the major point.

Mnr Barnard, dankie vir jou bydrae. Ek glo nie daar is nog ander nie. Ek dink ek sal daarby afsluit anders gaan ons te lank vat. Baie dankie.

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## THE DEVELOPMENT OF CONTROL FROM MECHANISM TO MANAGEMENT

By  
**I F Douglas and M Windle**

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### **MR F I U DANIEL: PRESIDENT**

Mr Iain F Douglas, CEng FIMEChE FBIM MConsE is Group Managing Director and Main Board Director of Kennedy & Donkin Group. In his executive capacity he has responsibility for the day to day management of the K & D group of companies, for the implementation of corporate policies worldwide. Mr Douglas has thirty years' involvement with K & D in the design engineering and supervision of hydroelectric projects, and has directed studies into the development of hydroelectric and thermal power projects, in the U K and overseas. For many years he was resident in Africa (Malawi and Botswana) as a partner for K & D companies in those countries, and Mr Michael R Windle, BSc CEng MIEE is Managing Director of Kennedy & Donkin Systems Control, which since 1981 has provided computer-based control services to a wide range of clients worldwide and to the projects of other K & D group companies. Following industrial experience in 1976 Mr Windle became Chief

Design Engineer (Control & Instrumentation) and later Engineering Manager for K & D power station projects.

He has been a director of KDSC since 1984. In 1988 KDSC acquired a majority interest in a computer services firm, now operating as K & D Information Systems, of which Mr Windle is chairman.

### **MR IAIN F DOUGLAS — GROUP MANAGING DIRECTOR**

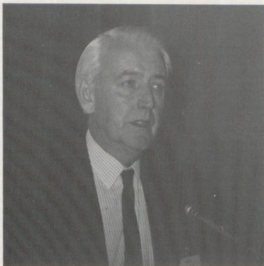
Mr President, Ladies and Gentlemen, the 19th Century in Britain was a time of enormous industrial development when a relatively small and dedicated group of engineers were responsible for a wide variety of achievements in the design, manufacture and construction of canals and bridges, highways and railways, in steam navigation, in manufacturing plants and processes.

Towards the end of the century, the Government was active in encouraging still further technological progress and Politicians and Investors alike were seeking the services of individuals with the knowledge and integrity to be able to offer sound and impartial advice. It was in this climate that Consulting Engineering emerged in Britain as a profession in its own right.

The new profession combined technical knowledge with entrepreneurial skill and the Victorian ethics of impartiality and fairplay. The profession set high standards for itself and these continue to this day — they have more than stood the test of time. Britain has led the world in providing consulting engineering services based upon outstanding engineering ability and the highest standard of ethics.

One such individual to emerge at that time was Professor — later Sir — Alexander Kennedy. Recognising the potential for one of the newer technologies — Electricity — Alexander Kennedy resigned his Chair of Engineering at University College, London and, in 1889, founded his own independent consulting engineering practice. Thus began the firm of Kennedy & Donkin which has since grown to be an international multidisciplinary consulting engineering firm with a staff of well over 820 and which, this year, is proud to be celebrating its Centenary.

Alexander Kennedy was a man of immense energy, ability and vision. Starting his career as a Marine Engineer, and without the benefit of a University education, he nonetheless achieved eminence in the academic world. In recognition of this, the Chair of Engineering at University College bears his name to this day.



Mr I Douglas

Alexander Kennedy, and his son John, played major roles in the establishment and structuring of the electricity supply industry in United Kingdom. It is interesting that, at the time of its Centenary, Kennedy & Donkin is once again involved in assisting in re-structuring the electricity supply industry in the run-up to privatisation. It is, perhaps, a happy coincidence that the headquarters of Kennedy & Donkin is located on the site of the first-power station which provided an electricity supply to the first U K street lighting scheme at Godalming in Surrey.

Amongst a number of events to celebrate its Centenary, Kennedy & Donkin has prepared a Centenary Lecture which, later this year, is to be presented at the IEE in London.

As Consulting Engineers, we are primarily concerned with the design of engineering systems. The ever increasing need for effective control and management of such systems, in the interest of efficiency, economy and quality has led to dramatic developments in the system control field.

It is therefore entirely appropriate that we should have adopted the title "The Development of Control from Mechanism to Management" for our Centenary Lecture.

It is my pleasure to introduce Michael Windle, Managing Director of Kennedy & Donkin, Systems Control to present our lecture which, Mr President, we have been honoured to have had included in the programme for the 51st Convention of your distinguished Association.

## SYNOPSIS

Traditionally, systems for the control and management of plant have been supplementary to the major investment. These systems represent a relatively low proportion of the overall cost and their minimum function is to enable the plant to operate safely and economically. This is not always achieved over the full range of operating conditions during the lifetime of the plant.

In reviewing developments, links are drawn between operating costs and the level of control and management technology applied to the basic investment.

Examples of applications from the fields of Power, Water, Building Services and Transport are reviewed illustrating the different progress made in respect of control and management functions. The implications of ill-directed technology are shown to result in under performance of the whole investment. Experience of reinvestment in control and management systems for existing plant is considered, highlighting the potential problems when poorly executed systems inadvertently block development options.



Mr M Windle

Finally a comprehensive approach is proposed to the application of modern methods of control and management. This permits the short term needs for operability and economy to be met without closing off longer term development paths. Further benefits can then be obtained from the investment when conditions change, as they inevitably will.

## 1. INTRODUCTION

"Operational Control of Plant" generally brings to mind industrial process control. However there are many types of process in which control, in the traditional sense of measurement, regulation and optimisation can be applied. This Paper takes examples ranging from the processes of producing water and electricity, to those of producing acceptable environmental conditions in buildings and extends the definition to the process of moving people and goods in a transport system. In each of these examples a clear link is established between information used for the purpose of control and that needed for management of the enterprise.

Investment in capital plant is always associated with the expectation of improved operation. This may be measured in better quality of product or service, greater reliability or, as is increasingly required today, in economic terms such as improved profitability. For success and survival in today's marketplace, it is necessary to operate existing investments to best effect and to develop new investments to meet planned business objectives.

The key to successful operation of plant is in its systems of control and management. These represent a relatively low proportion of plant capital cost, typically 3% - 15%, and generally employ quite different technologies to those involved in the plant process.

The functions of control and management form a continuous spectrum rather than being discrete and separate functions. Historically, much of the control and most of the management functions have been performed manually. However, the development of technology and the pressure for improved quality and economy of operation have led to increasing use of automatic systems for control and for the support of management.

Although the historical application of control and management technology has often been piecemeal, its growing capability now allows it to contribute strongly at all levels to the technical and economic success of current and future investments.

## 2. THE CONTROL AND MANAGEMENT OF PLANT

### 2.1 The Hierarchy of Control and Management

The functions of control and management of plant range from the immediate control of the process to the longer term activities that relate to the cycle of investment. These form a hierarchy of four groups of activities operating at different timescales according to function, as illustrated in Figure 1.

At the shortest timescale the process control level includes the immediate functions of maintaining safety, regulating key parameters in the face of process disturbances and sequencing the operation of components of the plant to meet short term demands.

From the immediate up to about a day, the supervisory level oversees operation of the plant unit and co-ordinates the larger aspects of the system to meet the immediate objectives. This level also responds to exceptional conditions and breakdowns to maintain the desired quality of operation.

At the scheduling level forward operational planning determines the necessary capacity for the economic and reliable servicing of daily, weekly and annual cycles of demand. The planning of major maintenance work to minimise unplanned breakdowns is an important part of this level of activity.

At the level of the hierarchy dealing with the long term issues, management activity analyses the economic, technical and quality performance of the business. Options for response to changing conditions must then be assessed before appropriate changes in practice or new investments can be initiated.

### 2.2 Control and Management Technology

The dramatic development of technology employed to imple-

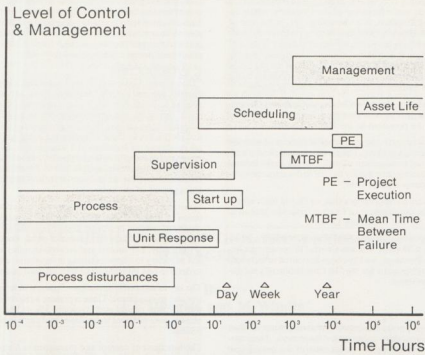


Figure 1. HIERARCHY OF CONTROL AND MANAGEMENT

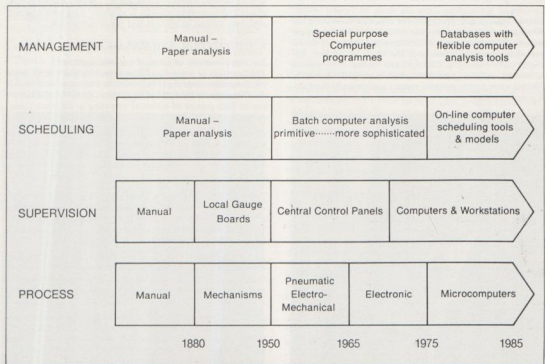


Figure 2. CONVERGENCE OF CONTROL AND MANAGEMENT TECHNOLOGY (Dates Representative of UK Power Industry)

ment the different levels of control and management is illustrated in Figure 2. The earliest developments away from dependence on the human element were in plant control and supervision where the speed and reliability of manual response were inadequate.

Progressively, technology has developed to support or supersede the human input at each level, providing functions which could not be performed reliably or economically by hand. However, at each level, the evolution of systems has converged upon the use of computer technology. This convergence has far-reaching consequences since operational data can now be immediately incorporated into the analysis and presentation of key business information to enhance decision making. At all levels of operation this new business tool offers the potential for the investment to be utilised in the most effective and economic manner appropriate to the circumstances.

### 2.3 Relationship with Plant Technology

Technology has advanced in every field of application, but these developments have not always made effective use of control and management technology. For a particular quality of operation, Figure 3 shows the simple relationship between operating costs and the capital expenditure on control and management technology. Up to a certain point additional control expenditure reduces cost, but above that level increased maintenance costs of the plant and its controls outweigh further improvement in the direct operating cost of the plant.

Considering this same relationship for advancing technology of the plant system as a whole, there is a series of curves of operating costs with minima at different levels of control and management expenditure as shown in Figure 4. The progression of technology generally increases this expenditure but does not necessarily result in reduced operating costs; improvement in other features such as safety, the quality of product or commercial flexibility may be the desired objective of development.

In order to minimise operating costs, an appropriate level of control and management expenditure must be selected. However, for the very reason that it is a small part of the total investment, the necessary optimisation is rarely considered.

The implications of these different perspectives of the development of control and management are wide. Experience in a range of fields, reviewed in the next section, highlights the many different issues which need to be considered in developing the control and management approach adopted for a particular investment.

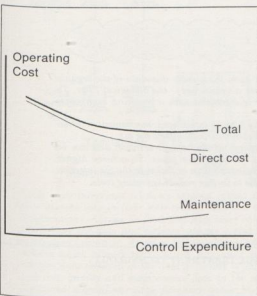


Figure 3. EFFECT OF CONTROL EXPENDITURE ON OPERATING COST

The views of the applications are set out in such a way as to enable their common features and contrasts to be identified. In each case, the basis of the business is described followed by an examination of the related development of control and management and the basic technology. Where useful, particular detailed aspects are analysed more closely to emphasise a facet of general significance.

## 3. APPLICATION REVIEWS

### 3.1 Water

The water industry is a deceptively complex business, dividing generally into the two parts of the water cycle i.e. supply and reclamation. These parts share a common business objective to provide at minimum cost a certain quality of water for consumption or for return to the environment and to meet demand with a high level of reliability.

Water supply systems include a number of stages. The raw water is abstracted from a source which may either be a river or an underground aquifer. The raw water is treated physically and chemically to remove impurities and ensure sterility before being pumped either directly or via buffering service reservoirs to distribution to consumers. There are several key requirements and restraints upon these activities:

- Product quality regulations
- Capability of sources to meet demand in drought summers
- Capacity of treatment works and distribution
- Losses from distribution networks

A typical UK water authority serves 5 million residents in an area of 14 000 sq km and supplies 1 800 Ml of water each day. Demand is growing at about 2% per annum. Typical annual cost of operation of the capital assets of around £1 billion, are £120 million.

Operating costs are affected by the complexity of the treatment process and by the energy consumption for pumping of water into the distribution network. Capital costs are primarily in major source reservoirs and in the distribution network.

Water reclamation, to a degree, reverses the processes of supply. Sewage is collected in a network of drains and gravitates, or is pumped, to treatment works. The treatment works physically separates inert material from the sewage and then employs biological processes to break down the suspended and dissolved organic content. The digested waste is settled, releasing highly purified effluent water for discharge to a suitable water course.

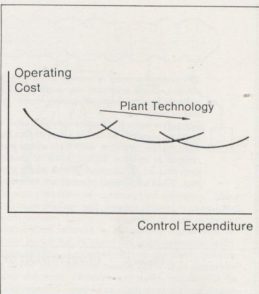
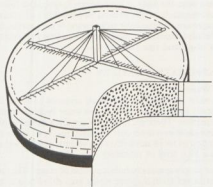
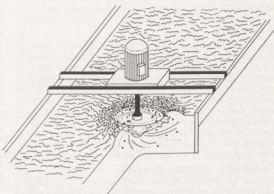


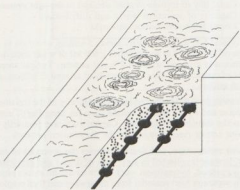
Figure 4. OPERATING COSTS WITH ADVANCING BASIC TECHNOLOGY



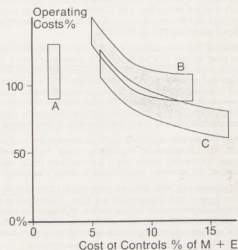
(A) BIOLOGICAL FILTER



(B) MECHANICAL AERATION



(C) FINE BUBBLE AERATION



The central process of sewage treatment is based upon the aerobic digestion of the organic content. Basic processes use a sprinkled flow over a gravel bed – the biological filter. To achieve modern levels of quality a low intensity of treatment with a resulting high plant cost is necessary.

Later developments employ aeration lanes into which air is introduced; mechanical aeration employs vigorous agitation whereas fine bubble aeration directly injects the air.

Fine bubble aeration uses only about half the energy of mechanical aeration and can be refined to achieve higher levels of treatment in the same size plant. To achieve higher performance the aeration profile along the lane is controlled in addition to the air injection rate. Thus additional expenditure on control is able to further reduce operating costs.

Figure 5. DEVELOPMENT OF SEWAGE TREATMENT TECHNOLOGY

The sewage sludge is either used as an agricultural fertiliser or is burned. The key requirements and restraints of water reclamation include:-

- Effluent quality regulations
- Treatment works capacity
- Limitation and vulnerability of biological processes

Operating costs are largely those of the treatment works, including manning and energy costs. The network of drains is a major part of the capital costs, but the sewage treatment works are often larger and more costly than water treatment works of corresponding capacity.

In the UK much of the existing infrastructure of water supply and sewage treatment was installed about one hundred years ago. Population growth and increasing standards for supply and effluent, combined with pressure for more economic operation, led to major developments in water technology, both in new and existing plants. The development of improved sewage treatment processes is illustrated in Figure 5. This shows that the more advanced processes offer lower operating costs and give greater benefits from higher levels of expenditure on controls. However, over-provision of controls is counter-productive beyond the point at which wear and tear on the plant from constant adjustment becomes excessive.

Despite the technical advances on the process side, control and management technology developed little beyond the application of mechanisms and gauge panels before the mid-70's. Following a major reorganisation of the industry in 1974, larger units were created which were able to perceive the potential benefits of the new technologies of computer-based control and remote supervision. However, lacking a sound basis of prior experience, many applications were technology rather than needs driven. A substantial proportion of these add-on systems were unsuccessful and it is illuminating to examine the causes of failure.

The major difficulties arose because the needs and limitations

of the application were not properly recognised. As a result, over-ambitious process control schemes were installed only to be plagued by unreliable measurements and unexpected process behaviour. Computer-based telemetry systems communicating measured parameters and alarms for remote monitoring suffered from untrustworthy signals and inappropriately defined software. The consequences of this misdirected investment includes failure to obtain the desired benefits, an increase in costs for higher levels of maintenance and under-performance of process plant because of a loss of effective supervision and a reversion to manual control.

In addition to the direct consequence of inappropriate control and management technology, there were several important indirect consequences. The first was that, despite the widely recognised value of plant data for management information, few applications effectively addressed the relationship between plant operational and management information needs.

The second significant feature of many telemetry schemes of this era was a close reflection of the organisation structure in the design. This meant that when the reporting structure of the organisation was changed to meet management needs, the control and management provision was no longer appropriate. Further expenditure was needed to replace or relocate and reconfigure systems.

Finally, the natural consequences of this ineffective expenditure was the desire of responsible management either to replace the inadequate systems at the earliest possible date or to avoid the new technology altogether.

Arising from the mixed experience of earlier systems, many UK water authorities have since adopted a much more considered approach to reinvestment in the essential control and management technology. As a result several large schemes of reinvestment in integrated supervisory and management systems are currently in progress. System designs for these new schemes have adopted a much more open approach, illustrated in Figure 6.

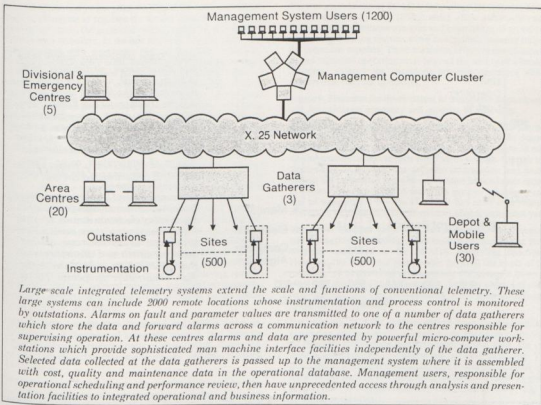
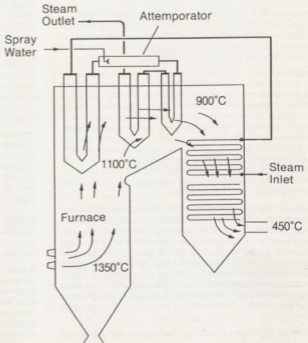


Figure 6. LARGE SCALE INTEGRATED TELEMETRY AND MANAGEMENT SYSTEM

In conventional power plant steam is raised in a boiler at high temperature and pressure for expansion through the turbine which drives the electrical generator. The nature of the steam cycle is that efficiency rises about 4% per 100°C of additional steam temperature. Plant development has therefore striven to maximise the steam temperature consistent with adequate plant reliability.

Plant reliability is affected by the outlet temperature as various failure mechanisms are accelerated at higher temperatures. This is reflected in an exponential loss of life of high temperature components with rising temperature.



Boiler outlet temperature suffers various disturbances, particularly from changes in load, which are corrected by control of the flow of spray water into the attemperator (see Figure). The effect of the spray flow adjustment usually takes several minutes to be observed at the outlet and, if an excessive increase is made manually, large swings of temperature occur. These accelerate life usage of the high temperature components.

Automatic control has developed from basic, but consistent and effective strategies using electronic control, to more sophisticated algorithms using micro processors, which take into account other conditions and disturbances so that efficiency is maintained while high temperature component life is extended.

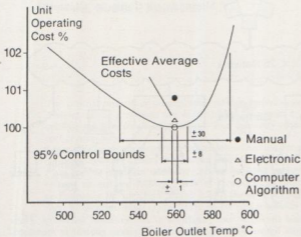


Figure 7. CONTROL OF BOILER OUTLET TEMPERATURE



The open structure and partitioning of these systems enables expansion or re-configuration at each level to be easily and economically achieved. Furthermore operational information is made quickly accessible to management for decision support and to enhance understanding of the actual, rather than the perceived, capabilities and limitations of the plant.

These systems will provide powerful tools for the management of the undertakings as they address their changing commercial and environmental responsibilities.

### 3.2 Power

A power system is a closely linked process with generators driven by hydropower, diesel engines, gas turbines or steam turbines fed from nuclear or fuel burning boilers. The electricity generated is transmitted over a network of high voltage lines to the rural or urban load centres where it is transformed to lower voltages and distributed to the consumers.

The power industry is similar to the water industry in meeting a varying demand for its product from a number of central sources. However in one key respect it differs. Effectively there is no storage of electrical energy in the system to provide a buffer for imbalances between supply and demand. Without automatic mechanisms to control frequency or to clear faults, electrical systems would collapse totally in a few seconds following any significant failure or upset. Automatic control has therefore an essential role in the power industry and this is exercised both in generation and in transmission/distribution. The nature of the industry has driven control and management technology as few others have.

The key issues which arise in the control of generation are:

- Maintaining the constant balance of supply and demand
- Maintaining the quality of supply — voltage, frequency and availability
- Employing plant capacity to maximum economic effect
- Ensuring that capacity is available to meet long term demand in the face of long project timescales.

Control of thermal power plant developed from the use of feedback mechanisms to regulate the fastest elements such as the turbine governor, the generator voltage regulator and the feed water supply to boilers. In the late 1930's in America these were supplemented with pneumatic control for other functions. Despite success in some areas, extension of pneumatic controls to more complex functions failed due to their limited speed of response and inability to offer the more subtle control functions. As a result, manual control with its higher costs of manning and reduced performance had to be retained. Nevertheless the development allowed a refinement of plant design so that subsequent generations of plant in the 1950's, such as the 120MW Agecroft 'C' units, employed pneumatic controls on a more advanced boiler design offering lower operating costs.

This same pattern of development was repeated for electronic controls when they became available in the 1960's. At first, there were attempts to make ambitious use of the technology with complex schemes installed on the early 500 MW units in the UK. Again substantial parts of this investment were never effective since the inflexibility of the design and the urgent priority to generate power, severely restricted the refinement of the design at commissioning. Such experience of early electronic analogue systems has been widespread across the world with priority being placed on generation output at any cost. As a result the benefits of automatic control in achieving reduced plant wear and tear, reduced manning, improved performance, and more predictable response under disturbed system conditions have not been gained.

Subsequently, systems have developed and, with a better understanding of the value of automatic control, they have become effective and essential parts of power plant. Figure 7 illustrates the impact of these developments on steam temperature control.

The most recent developments of power plant control have included the application of microprocessor technology. The capability of this technology has made the use of more sophisticated control techniques cost effective. Much of the investment

in the technology has been as refits to existing plant. As a result the objectives and nature of the problem have been better understood and, with the flexibility for subsequent refinement inherent in software based systems, experience of the application of microprocessor control has generally been good. Figure 7 illustrates the effect of microprocessor technology on the performance of steam temperature control, where more sophisticated algorithms, only possible on microprocessor systems, refine performance and extend high temperature component lifetimes. The success of microprocessor control systems is such that they are now employed on over 70% of units of 200 MW capacity or more, in the UK, representing over 85% of generated power in 1988.

The other aspect of control and management in the power industry is generally described as SCADA (Supervisory Control and Data Acquisition). These systems provide the overall co-ordination and scheduling of generation in addition to the supervision of the power system itself.

SCADA systems have developed from limited datalogging systems used to aid manual scheduling of generation in the early 1950's to much more sophisticated tools. The development first led to improved presentation of operational data so that the system operator could perform better. Progressively, computer analysis of the state of the generation, transmission and distribution systems has led to improved methods of operation making maximum use of network capacity while maintaining security of supply and increasing the economy of operation.

As an example, the control of reserve capacity indicates the trade-off between cost and risk that has to be made. A reserve capacity related to forecast demand is held on operating and partially loaded steam plant, fast response pumped storage and gas turbine plant as shown in Figure 8. Beyond the plant reserve, response to a major breakdown incident is by means of load reduction and shedding. The aim is to operate economically without exceeding a defined risk or occurrence of disconnection incidents.

Current generations of SCADA technology incorporate Energy Management Systems (EMS) which allow automatic computer control to optimise margins and interchange of power between neighbouring systems while maintaining security targets for consumer supplies. These maximise effective use of capacity and minimise operating costs beyond the ability of a human operator, without the variations between operators which characterise manual operation.

Figure 9, illustrates the development of automatic despatch control for optimum economy and security of operation.

Experience of the development of SCADA and EMS has not always been good. In many instances knowledge of the characteristics of the electrical system has not been adequate to enable the systems to deliver their anticipated savings. Greater understanding of the need for accurate information and sound models has meant that more recent systems have a better record of success. Modern SCADA and EMS systems contribute savings of typically 1.5% - 3% of overall fuel costs over manual operation, repaying SCADA investment several times each year.

The power industry has a very well developed use of control and management technology, with modern systems linking power plant conditions to the SCADA scheduling functions. However, the important relationship between the levels of the hierarchy of control and management, for example between plant operating data and information, both for control of short term operation and long term planning, is not generally reflected in the current systems.

For example, SCADA systems extend from the high voltage generation and transmission network into the much more capital intensive distribution infrastructure. At that level, the systems support remote supervision and network switching. The direct use of information on power flows from the SCADA systems for the analysis of load growth and thus for capacity planning is not yet implemented, but experimental work, e.g. at EPRI, is in progress.

Thus, both in power plant and in power system control there

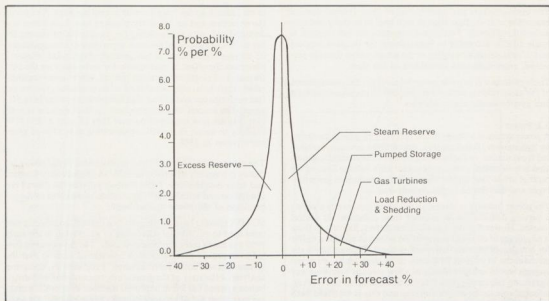


Figure 8. TYPICAL RESERVE CAPACITY ALLOCATION

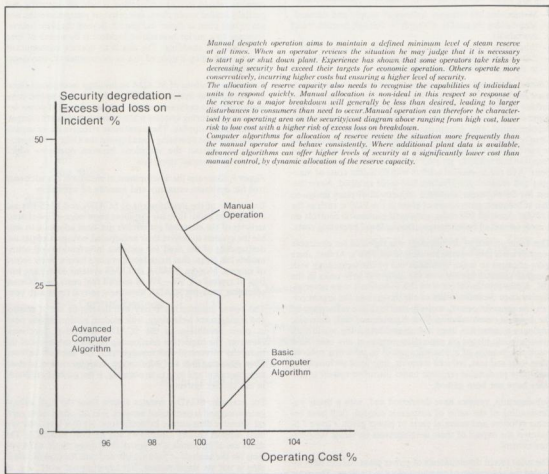


Figure 9. DEVELOPMENT OF DISPATCH CONTROL

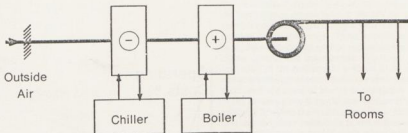


Figure 10. SINGLE ZONE AIR CONDITIONING SYSTEM

is potential for development to obtain the benefits of the wider use of operational information to enhance methods of working and to inform investment decisions to maximise the effectiveness of the power industry as a business.

### 3.3 Building Services

Most large buildings are erected to provide a controlled environment for commercial, industrial or leisure purposes. The building services transform a building shell into an environment for the specific purpose. These services comprise the environmental services, the utilities for building occupation and the safety services for smoke and fire detection and for fire fighting.

The specific building service considered here is the core function of heating and ventilation, although lighting, lifts, power and water distribution also form part of a larger group of services which are related and are increasingly being managed together.

Heating and ventilating systems are installed to provide a working environment suitable both for the activity being carried out and for comfort of personnel. The systems generally provide means of heating or cooling the working space and providing a flow of fresh air ventilation. Usually the sources of heating and cooling are centrally installed boilers and chiller units. Various alternative arrangements have been developed to couple these sources to the work areas either by circulation of air or water or a combination of the two.

Irrespective of the specific arrangement adopted, there are common key issues in the application of building services:-

- Meeting desired quality and reliability of environmental control over daily and seasonal extremes of use
- Operating plant as economically as possible
- Integrating operation of the system with other sources of heating e.g. lights
- Ensuring that new plant gives the best trade-off in terms of capital cost vs operating cost

Early heating and ventilation systems were manually controlled with adjustment of the firing rate on boilers or opening of windows to regulate room conditions. The first air conditioning systems in New York around the turn of the century were known as single zone systems, shown schematically in Figure 10. They ducted warmed or chilled air to rooms throughout the building with primitive manual control of the flow to each area by regulating the exhaust air flow. Automatic control of these basic systems developed slowly, first with electric thermostatic control in the 1930's and then, more successfully, pneumatics in the 1950's. Although these systems operated more effectively than hand control, low energy costs did not encourage widespread application of more sophisticated and economical systems.

In 1974 when energy costs suddenly rose substantially, the industry responded by employing more economic control techniques. Microprocessor-based optimisers, which calculate when to start plant to reach working conditions by the requisite time,

were developed and widely employed from 1977. The methods of control of heating systems have a major effect on operating costs. The operation and benefits of alternative systems are illustrated in Figure 11.

In parallel with improvement in controls, the plant itself was developed to minimise energy losses. Firstly, independent control of the different zones of the building was extended to recognise the differing heating and cooling loads resulting from the local variations in solar gain and occupation. Secondly, more elaborate configurations of plant such as induction systems and multizone systems were adopted to minimise energy consumption by reducing losses. The impact on operating costs of these developments was considerable as illustrated in Figure 12. Finally heat pump systems were introduced to recover heat from the building at the end of the working day into a "pool", to be returned the next morning to minimise the warm-up energy demand.

The almost incidental effect on the quality of environmental control was no less substantial than the reduction in operating costs. For example temperature variations within the London Stock Exchange were reduced from about 5°C to 2°C by recent refurbishment of the plant and controls.

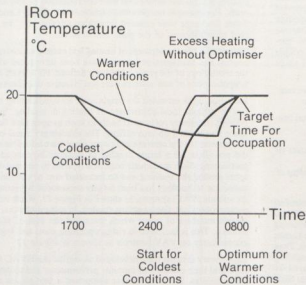
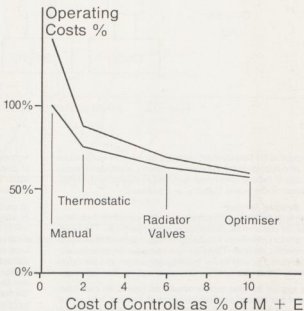
Throughout the development of heating and ventilating systems, control and management systems have been introduced after the technology of the process has been defined. As a result early applications of new systems were less effective than desired.

Induction units extended the single zone air conditioning system to provide local adjustment of heating or cooling. Such systems frequently performed badly as soon as open plan floor space was broken up into offices. The elementary zonal control systems for the central conditioner plant were inflexible and did not allow for a larger number of zones to be created by partitioning. Such inadequate control is typified by hot and cold spots around the building and an increased cost of operation. Induction technology has been largely superseded by variable air volume (VAV) systems, as shown in Figure 13. While being more economical, these systems created, in some instances, excessive numbers of zones which increased the cost of maintenance. This is indicated in rising operating costs and higher expenditures on VAV controls as shown in Figure 12.

Supervisory systems have developed alongside the HVAC systems and their controls to monitor performance and to detect plant failures. Early equipment comprised a few gauges and thermometers located around the building. Later this was extended to gauge panels at plant locations with a large central manned supervisory panel. Subsequently computer-based building management systems were introduced to monitor the growing number of measurements and alarms using basic telemetry technology. Although these gave access to the data, their facilities were limited and inflexible. Sometimes they proved difficult for plant supervisors to use so that on the first indications of a problem the system would be ignored and the supervisor would attend the problem area in person.

Primitive heating systems kept the boiler in operation on a seasonal basis. Control of room conditions was achieved by opening or closing the radiator valve and the window. The system losses incurred costs at all times and environmental conditions were not adequately controlled.

The introduction of a central room thermostat from the 1930's reduced unnecessary boiler operation but was unable to control the losses resulting from the different room demands arising from varying occupation and solar warming.



The application of thermostatic radiator valves from 1965 allowed a much better control of individual rooms and improved the economy of operation. In 1977 start-up optimisers were introduced. These measured inside and outside temperatures during the night and calculated the latest time the heating could be started to achieve working conditions by the requisite time. This eliminated wasteful early start up when milder conditions prevailed. Experience of the development of controls has made possible a reduction in operating costs for additional expenditure on controls.

Figure 11. DEVELOPMENT OF HEATING SYSTEMS

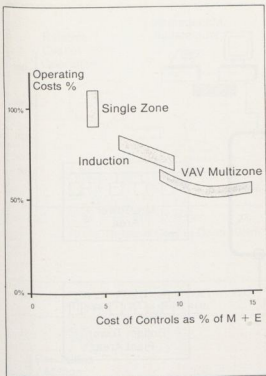


Figure 12. OPERATING COSTS WITH DEVELOPMENTS IN AIR CONDITIONING CONTROL.

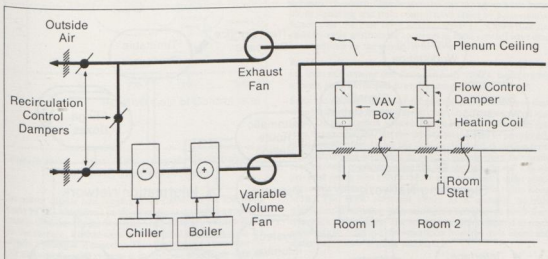
The most recent developments in building management, as shown schematically in Figure 14, represent a move to integrate the local digital controllers for the HVAC plant with the supervisory system, as for example with the refurbishment of the London Stock Exchange. These systems extend a much enhanced presentation of process supervisory information into the higher control and management functions. This enables performance of the building as a whole to be analysed and economic scheduling of operation to be optimised. At the management level the trend of energy consumption and performance of the existing plant is significant because HVAC systems have a shorter life than the building structure. Experience of operation can therefore contribute to the definition of a cost effective development or replacement which will confidently meet its performance and economic objectives.

The effective integration of process control data with the short and longer term management of the building is seen to offer significant benefits. These include the ability to identify divergence from optimum performance and hence to adjust or maintain the plant appropriately and to highlight shortfalls which require capital expenditure and to direct that expenditure to solve the problem cost effectively. These benefits have a significant financial value which needs to be more widely recognised in the industry.

### 3.4 Transport

Transport encompasses a very large field but one which shares a common basic set of objectives, notably the need to move passengers or goods reliably, safely, quickly and cost-effectively. The modes of transport are differentiated by their speed, economy and flexibility, etc. and these differences are reflected in their control management systems. For the purpose of this Paper, rail and rapid transit systems are examined.

Rail and rapid transit systems comprise four major components; the permanent way, the rail vehicles, passenger access facilities and any goods handling systems. The permanent way represents



Variable air volume (VAV) systems were introduced in about 1960. These permit a building to be divided into many zones of automatic environmental control. VAV systems achieve a better match between cooling load in the rooms and cold air flow. Room temperature is controlled by regulation of the VAV box cold air damper. This reduces the operating cost penalty of induction systems where all the air is cooled but the boiler may need to be run to reheat some of the air to cater for variations in cooling load around the building. On account of its greater complexity, VAV systems include a higher content of control than the alternatives, although operating costs are significantly reduced.

Figure 13. VARIABLE AIR VOLUME SYSTEM

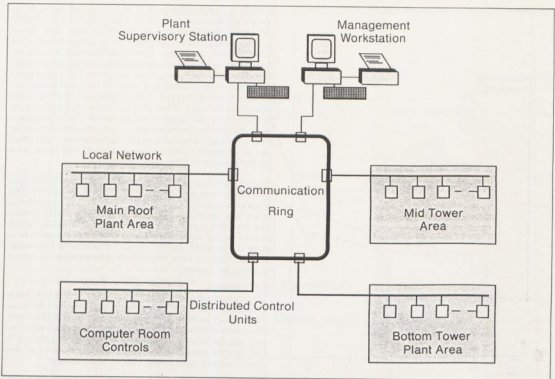


Figure 14. ADVANCED BUILDING ENERGY MANAGEMENT SYSTEM

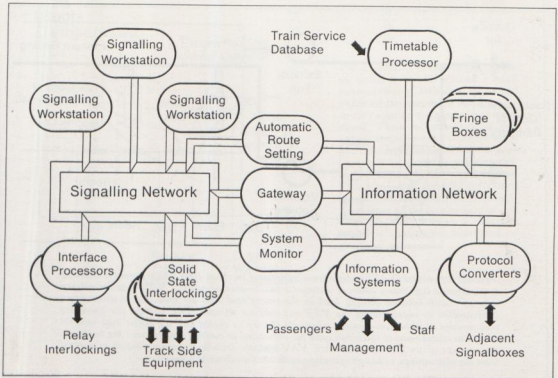


Figure 15. ARRANGEMENT OF INTEGRATED ELECTRONIC CONTROL CENTRE

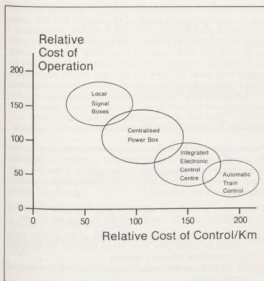


Figure 16. OPERATING COST WITH DEVELOPMENTS IN TRAIN CONTROL.

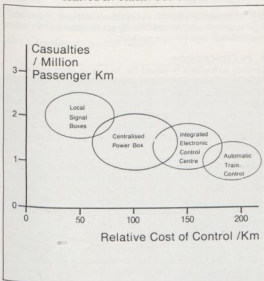


Figure 17. CASUALTY RATE WITH DEVELOPMENTS IN TRAIN CONTROL.

the major capital cost ranging from £60M/km for the Hong Kong MTR, which runs predominantly in tunnels, to approximately £3M/km for the Sheffield Light Railway, which will run on the surface. Vehicle costs and marginal operating costs are largely a function of capacity. Thus the business imperative for rail and rapid transit systems is to compete effectively with alternatives by maximising the usage of the fixed assets to a predefined timetable.

Most rail and rapid transit systems operate to a fixed timetable with services interleaved along segments of the system, making smooth operation vulnerable to upset. Movements through the system have to be controlled to maintain minimum safe stopping distances between trains, which effectively determine the maximum traffic capacity.

The key business issues which affect rail and rapid transit systems are:-

- Competitive performance with alternatives

- Maximum use of capacity
- Safety of operation
- Reliability of service
- Economy of operation
- Passenger comfort

The control and management systems are therefore directed to ensuring safety and promptness of service with economic operation. Of the various areas of control and management, the development of train control will be examined in some detail.

Early train control systems employed mechanical interlocks and signalling from signal boxes located a few kilometres apart. Mechanical systems were superseded by electrical equipment starting around 1920 in Germany. In the UK, commencing in the 1960's, interlocking systems and supervisory mimics were centralised into major "Power Boxes" for sectors of about 200 route km.

Such centralisation of control, although technically sound, introduced problems of operating practice. The operators found some difficulty in grasping the overall significance of local disturbances such that the desired smoother running of the network was not fully realised. Indeed, in some instances, power box manning levels had to be increased to achieve the desired quality of operation.

In high traffic urban areas, the peak frequency of rail services through complex networks is very arduous to control manually and any breakdown quickly causes severe disruption. The development of integrated electronic control centres provides automatic route setting at the central power box, as shown in Figure 15. This enables operators to control services more effectively, since they only handle manually the exceptional situations, while the computer system allocates routes to routine services. With the development of solid state interlocking, capital and revenue cost savings were anticipated by the elimination of electrical interlock relays. In the event, additional verification and validation costs for the safety critical software balanced the expected capital cost savings. So far, maintenance costs appear to have been reduced as anticipated.

The implications of the development of train control are shown in Figure 16, where it can be seen that operating costs attributable to signalling and train control have fallen by a substantial factor over the past forty years. Figure 17, shows that the casualty rates attributable to errors in train control have also been reduced by the advances in train control.

Rapid transit systems tend to operate a simpler end-to-end routing than rail systems and since the early 1960's, rapid transit systems have developed towards unmanned trains.

Early automated trains used discrete component analogue electronic technology for train speed control, linked to central systems. On the London Victoria line, opened in 1969, such systems were employed, but the driver was retained to be primarily responsible for closing the doors safely and initiating train starts. Problems of quality of control arising from automatic braking were overcome when the relevant equipment was superseded in the mid 1970's. More advanced but similar semi-automatic systems installed since then include the Hong Kong MTR. The MTR performs better as it includes on-train microcomputers rather than analogue electronics to control acceleration and braking. The micro-computers respond to track speed signals reflecting the separation from the train ahead and station approach braking markers.

Train control systems reflect the relationship between the vehicles and the permanent way. The passenger also relates to the system through the ticketing and access systems and by means of the train information systems. The integration of passenger information systems with train control systems is already becoming standard practice for integrated electronic control centres, with benefits of greater passenger confidence from improved information.

Following lengthy development of fully automatic systems for the San Francisco Bay Area Rapid Transit from 1972, the first large scale fully automatic and unmanned rapid transit was constructed at Lille in France in 1983. This has been followed by

others at Kobe & Osaka in Japan and, more recently in Vancouver, Miami, Detroit and London Docklands. Experience has shown that these systems have an excellent safety record and generally an availability over 99%. However, savings have not been as large as anticipated, in part due to increased maintenance staff costs for the higher level of skills required. Another aspect has been the need, in many instances, to retain some manning on the trains to give passengers the feeling of personal safety.

The developments which have been reviewed here are primarily associated with train control. Nevertheless development of other facets of control and management are very important; at the scheduling and management levels the integration of passenger statistics from automatic ticketing systems will permit improved allocation of resources and timetable planning.

More generally the increased use of operational information such as traffic, vehicle condition parameters, actual journey times etc. will, for management purposes, allow better analysis of performance and aid decision making concerning operating practices or future investment. Such a development is necessary to provide the essential tools for public transport to retain a competitive position.

#### 4. DISCUSSION

It is first necessary to recognise that while an investment may solve a problem, the solution has a wider impact on the business. The solution must therefore be evaluated in the light of all the objectives that might apply. Examination of the different application areas showed a diversity of needs for different control and management approaches. However, a number of significant issues can be identified:

- (1) Control and management systems need to be considered alongside the process, mechanical and electrical systems when a design concept is being prepared, rather than being added later. Then, consistent limitations and objectives can be set for the whole investment rather than in a disparate way for its parts.
- (2) The control systems measure a variety of significant parameters for the relatively immediate task of ensuring effective plant operation. However this information has a wider value for overseeing the performance both of the individual plant elements and of the system of investment which comprises the business. For example, the data could become available to be interfaced to an associated plant system to improve overall performance. Additionally, it could be used for management analysis, to obtain potential benefits in terms of more economic utilisation of capacity and better informed investment decisions.
- (3) New investments frequently fail to assess adequately the balance between the costs of control and management technology and the direct benefits that may be obtained. Several of the applications identified over-ambitious use of technology which failed to deliver the anticipated benefits. However on re-investment projects it is much more likely that a trade off is made between the level and scale of technology employed and the benefits likely to accrue, because the risks presented by the technology are better understood from operating experience.
- (4) Control and management technology offers many alternative solutions to each application. Some of these may appear to be attractive least cost solutions at the outset, but will prove to have closed off development later in the life cycle of the application. For example, the UK water authorities found that the structure and technology of early telemetry systems were not sufficiently flexible to permit expansion or development to reflect changing organisational structure.

#### 5. A STRATEGIC APPROACH

An example of a strategic approach, indicative of the variety of approaches that need to be employed in different industries, is the way in which one UK Water Authority has planned a major investment in telemetry and management systems to link the whole of its business.

The objectives to be met were first identified. These were to

reduce operating costs, improve quality of operation and integrate analysis of performance of the existing and new assets with overall management. From this definition, more detailed aspects were examined to identify where and how savings could be effected and where quality of operation was more significant. Specific categorisations of the large number of sites involved were made to enable the cost and benefit implications to be examined and an optimum level of site investment selected. The functions of the supervisory and management systems were examined in a similar way, so that features supporting the primary objectives were included whereas others were not, although flexibility to incorporate them later was provided.

Design options for the system were considered and tested against the overall objectives of the scheme and its context of organisational change with privatisation of the industry. From this point the conventional stages of specification, evaluation and contract management were followed.

The scheme, generally as set-out in Figure 6, is now close to its completion and the benefits of the strategy have been:

- (1) The costs of achieving the objectives of the scheme were reduced by about 50% from those expected on the basis of comparable telemetry systems
- (2) the scheme has maintained its programme and remained within budget
- (3) organisational change of a much higher order than anticipated has been absorbed without adverse effect on cost or programme.

It is important to note that the timescale and cost of this strategic approach was not significantly greater than that for more conventional case by case methods.

#### 6. IN CONCLUSION

Control technology is valued for its role in plant operation. However, the convergence of this technology, on computer based systems, to become an essential part of business management, is only just being realised. By adopting a strategic and systematic approach to its use, business can now benefit from employing control and management technology as a uniquely powerful tool for enhancing the overall performance of the enterprise.

Within the limitations of this paper, it is impossible to do justice to the impact which computer based technology is having and will increasingly have on the sample industries chosen, and on others. The trends are obvious and inescapable. It is our responsibility as engineers to implement the technology wisely for the benefit of society.

There are many implications of this strategic approach for the engineering project industry for the future. One of the most important of these implications is that success will come only from a recognition of the changing relationship between the technologies of the plant and its control and management systems. This requires a combined effort on the part of those with understanding of the application and those with special knowledge of the capabilities of control and management technology. A detailed knowledge of the latter is not necessary for all the contributors, but a pragmatic understanding of the underlying objectives is essential. This in turn has implications for the training or re-training of engineers whose knowledge would previously have been confined to the more traditional disciplines of their industries.

#### 7. ACKNOWLEDGEMENTS

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# DEVELOPMENTS IN POWER SYSTEM PROTECTION AND THE EVOLUTION OF INTEGRATED SUBSTATIONS

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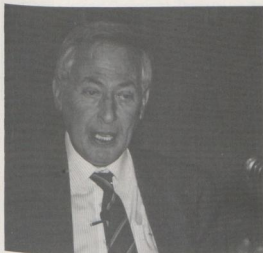
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### Introduction

Throughout the world, electrical utilities are endeavouring to improve the quality and reliability of the supply of electrical energy in the most economic manner. To achieve this goal, development of primary and secondary equipment for generation, transmission and distribution is needed. Power system protection equipment is an important facet of this development.

The availability of micro-processor technology has greatly assisted developments not only in protection but also in data acquisition and control systems. Even now, we have considerable experience with digital relays which combine protection and control functions. The latest generation of equipment has the facilities to communicate with substation computer systems and greatly enhance the reliability, safety and functioning of the entire power system.

This paper highlights recent developments in transformer and feeder protection equipments which not only show considerable technical and economic advantages over existing apparatus but also have this "conversational" ability.

### Transformer Protection

The classic Merz Price transformer differential protection circuit has been used for 80 years and the basic principals are as valid today as when first proposed by Dr. Bernard Price in the early years of this century. In applying unit protection to power transformers two special problems arise viz. the unbalancing effect of tappings on the transformer windings (which cause the relationship between the magnitudes of the input and output currents to vary) and the magnetising inrush current which occurs when switching on a transformer. The first problem is

usually dealt with by employing bias or restraint on the relays so that the current required to operate the protection increases roughly in proportion to the through-fault current. The second problem represents a much greater difficulty. It used to be dealt with by introducing time lags but this is most unsatisfactory. Work done by F.L. Hamilton in the early fifties showed that an easily identifiable difference between magnetising inrush currents and internal fault currents lay in their wave forms — fault currents being nearly sinusoidal whereas magnetising currents contain appreciable second harmonic components. The Duobias system of transformer protection derives its "magnetising" stability by taking this into account. This principal was adopted by most manufacturers and has become the industry standard.

Over and above laboratory development tests extensive site testing on 30 and 60MVA transformers provided a wealth of background which established Duobias protection as one of the most reliable equipments ever produced. The first Duobias relays were installed in Barking Power Station in 1952 — and the protection is still in production 37 years later!

It was perceived, however, that the transducer magnetic amplifiers used in Duobias were bulky — and becoming very expensive due to their high nickel content. Further, protection operating times were being decreased and faster transformer differential protection was required. The decision was made to continue the trend to integrate all the transformer protection functions into one unit to produce a cost effective package that met all known user requirements.

The field test records on Duobias were studied and extensive computer simulations indicated that the existing operating parameters so perfectly matched dynamic power transformer characteristics that the ideal relay should be a faster digital version of Duobias. An extensive design programme was instituted to produce a modern digital version — microprocessor based, using CMOS technology which has proved very successful in other protection products. The Digital Duobias relay, utilising software control, provides an extremely flexible operating characteristic with a range of variable bias slopes. (Figures 1 and 2)

As users will appreciate, in order to obtain the correct input currents for various transformer configurations and in order to utilise standard line CT ratios, additional interposing current transformers for ratio correction, phase angle shifting and zero sequence current removal are often required. The design of the Digital Duobias relay allows the ratio and phase angle and zero sequence corrections to be simply user-programmed and calculated digitally thus obviating the need for any external hardware. (Figure 3)

H.V. and L.V. restricted earthfault relays are also incorporated in the relay package and inputs from other protective devices such as Buchholz, winding temperature etc. can be accepted.

These inputs are individually addressable to give indication only, repeat output and indication or blocking functions, etc. The input is indicated with a discrete LED indication on the front panel of the relay. Up to 16 such inputs can be accepted (8 per card). The front panel also contains another 14 LED indicators which indicate which protection within the relay has operated and which phase etc.

The relay also incorporates a transient free, high set overcurrent element on each phase as well as an alpha-numeric display which is used to set the relay operating parameters, this can be scrolled to read the settings on demand.

A fibre optic input/output port is provided on the relay and this can be interfaced to a substation computer and/or an X-Y plotter via a RS232 convertor. This serial link provides 2 way conversational facilities enabling the settings to be remotely read or if required remotely changed. In addition, the relay continually stores and updates critical waveforms which can be down loaded into a computer if required. The current waveforms can be frozen by an external trigger or trip output to provide a facility for post fault analysis. The proportion of pre- and post-fault information is user programmable.

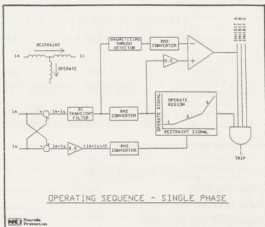


Figure 1 - Digital Duobias Relay

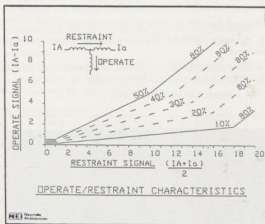


Figure 2 - Digital Duobias Relay

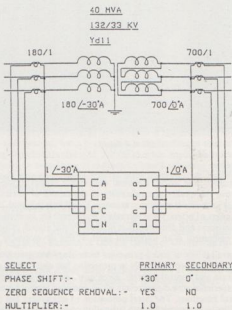


Figure 3 Star Delta power system transformer with protection current transformers in star star

The entire package is housed in a 19 inch rack case, 4U (178mm) high.

### Current Differential Protection

Merz Price feeder protection goes back to 1904 when it was first used in the North East of England on 10kV cable feeders. Detailed improvements in relaying saw the Solkor and Translay equipments introduced and the use of pilot wire feeder protection on important MV cables is now almost universal.

In the case of high voltage feeders — from 88kV upwards — overhead lines account for over 90% of all installations and distance protection has become the norm. To obtain the benefits of unit protection most distance protection is supplemented by the addition of information links usually power line carrier — to ensure high speed tripping for all faults on the protected line. Phase comparison protection using either Power Line Carrier or Voice frequency channels is also used but only in a small number of installations.

In recent years new communications media have become available such as microwave radio and fibre optic channels. These have a very wide effective bandwidth and are capable of transmitting complex digital signals. Furthermore, microprocessor technology with its large scale integration capabilities has made feasible true current differential protection working on vector comparison which besides giving settings down to 10% can be configured to cover multiterminal lines.

The type FDB equipment developed is of modular format and can be supplied to communicate over a range of difficult media. It can accommodate metallic pilots using a voice frequency channel, or an existing fibre optic or microwave communication link by interfacing directly with a standard voice frequency input on the communication terminal multiplexing equipment. In addition, the fibre can be directly terminated on the relay giving a dedicated fibre optic link. Despite the fact that with only one set of protection using the fibre link, which is thus greatly under-utilised, the natural immunity of such a link to induced voltages and noise renders this option very desirable especially in South Africa with our high lightning incidence. A short haul fibre optics link may also be used as a means of isolation to carry the signal out of an area of ground potential rise and high electrical noise, after which it is converted back to an electrical signal for transmission by conventional means.

In this case the optical signal consists of a digital pulse train, frequency modulated as before, so that compatibility is maintained with standard voice frequency channel. If the link is to-

tally optical, the greater bandwidth available can be utilised and it is possible to alter the pulse frequency and modulation characteristics to accommodate a greater linear range.

Just as the transformer differential protection described earlier is based on the classic Merz Price principal, so too this current differential protection makes use of Kirchhoff's Law that the vector sum of the currents flowing into the protected zone should sum to zero — any residual current is either due to a fault condition or a capacitive current. Figure 4 shows the operating characteristic of the relay; the operating quantity is the vector sum of the terminal currents. This must be greater than the threshold level for operation. The restraining quantity is derived from the average value at the terminal currents. As these measurements are in software, they can easily be varied to fine tune the characteristic for a particular application.

The protection can be configured either to give a phase by phase current comparison, or, when the channel bandwidth dictates the use of a single phase relaying quantity, a mix of positive phase sequence and negative phase sequence currents are derived in software.

For a reliable current comparison to be made, the propagation delay of the communication link must be compensated so that the waveforms being compared are correctly aligned in time. If this delay is known the associated time delay can be preset accordingly; otherwise this can be measured by the protection on demand or as part of a self check routine. (Figure 5)

The protection caters for two basic transmission modes viz:-

- (1) Pulse code modulation (PCM) for digital communication links. This allows the best performance to be obtained from the protection.
- (2) Frequency modulation (FM). The linear range of the protection is more restricted but it does allow the protection to be used where only VF links or pilot wires are available.

When digital communication is possible, the digitised current samples as used by the microprocessor are transmitted direct. 12 bit samples are used, a sample from each phase plus a control/status word is sent as a frame of information each time the relay samples the current waveforms. The data transmission rate is 64kb/s.

For VF working, the power system waveform is frequency modulated onto an audio tone carrier frequency at 1750Hz. This places the frequency spectrum of the transmitted signal on the flattest part of the channel's group delay characteristic. The

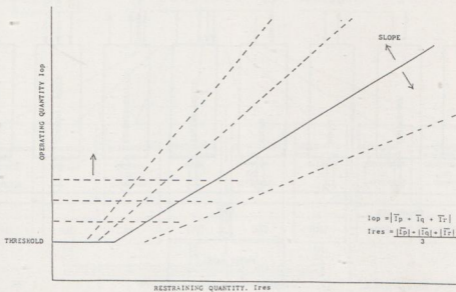


Figure 4 Relay Operating Characteristics - Current Differential Protection

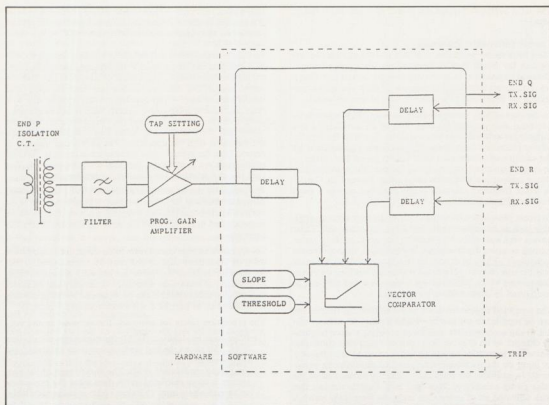


Figure 5. Block Diagram of the Basic Current Differential Protection

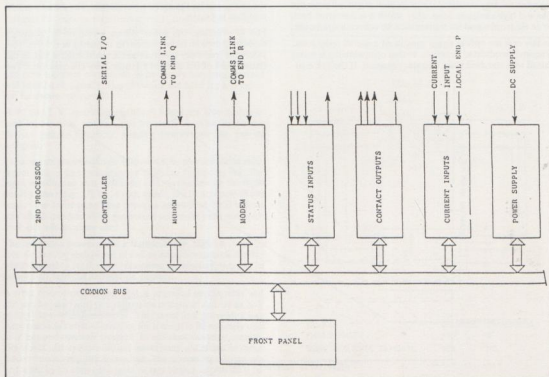


Figure 6 Typical Build-up of Modules

linear working range is limited to approximately 5 x setting which is a compromise between obtaining a good signal to noise ratio at low levels and limiting the sideband spread at high levels. This results in a characteristic similar to that obtained with Solkor protection i.e. vector comparison at low levels of current changing over to phase comparison at high levels.

Two types of interface are available for each medium — an electrical one and an optical one for direct connection to fibre optic cables.

The optical one is included because a short haul fibre optic link can be used as a means of isolation to carry the signal out at an area of ground potential rise after which it may be converted back to an electrical signal for transmission by conventional means. Although many different signals are usually multiplexed together over fibre optic cables to take advantage of the enormous bandwidth, in some application a dedicated fibre may be used for the entire link because of its immunity to electrical interference.

The electrical interface for digital transmission is to a twisted pair or alternatively an X 21 type of interface using a 15 way "D" connector. For VF operation the interface is designed to work with a 600 Ohm balanced line.

The optical interface consists of a pair of SMA style connectors on the back of the relay case, one for each channel, for use with 50/125 um fibre.

A separate serial communications interface via either a fibre optic link or an RS232 link provides for two-way communication between the protection and a substation computer/plotter giving similar facilities to those mentioned earlier in connection with Digital Duobias protection.

Both the Digital Duobias and current differential protection share a range of standard hardware modules. These comprise a variety of interface modules, a Controller, a Front Panel Housing Operator controls and displays. Data is transferred between the modules over a digital bus which links them all

together. The controller is the main processor module which controls the bus and the data transfers between the modules as well as carrying out supervisory functions and basic protection routines.

To relieve the computation burden on the Controller, a number of additional processor modules are installed. These work in parallel to, but are independent of the main Controller to provide a multi-tasking ability. Figure 6 shows a typical build-up for current differential protection. In this case, the 2nd processor module takes care of some of the more computationally intensive routines. This module uses a different microprocessor to that in the Controller — one which is more appropriate to high speed "number crunching". The Controller treats this like a "black box" feeding and retrieving data to and from it as it would any of the other modules. Protection set points are stored in the non-volatile memory which resides on the controller module. This is also used to preserve any vital information in the event of an imminent system failure.

#### Integrated Substations

The two protection equipments described above are not only state-of-the-art relays giving high speed operation, high sensitivity and high stability but also have a "conversational" ability to communicate with substation computers. Thus the relays fulfil a SCADA function in addition to their own. This is the basis of one of the most exciting developments in substation technology — the so called "Integrated Substation".

When Eskom were designing the complex interlocking and control at Alpha and Beta Substations they came to the conclusion that conventional relay logic would be very expensive and lacking in reliability. They chose to go to digital computer control and this bold decision has proved to be both technically and economically sound.

The computers used in this application have tremendous additional capacity and this capacity can be utilised to considerably enhance the operation of the power system. The data out-

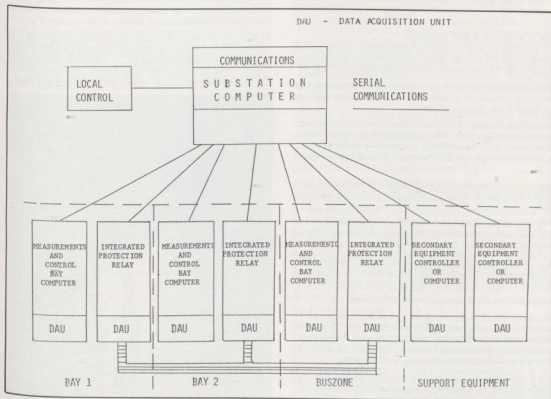


FIGURE 7 - INTEGRATED SUBSTATION

puts from the relays described can provide useful information on load flows and load sharing as well as give a complete picture of the power system under fault conditions. Fault currents, fault distribution and relay element operations can be recorded and hard copy of the data as well as graphical plots can be provided. Fault switching to reconfigure a power system after the loss of an item at faulty plant can be automatically, correctly and speedily carried out so optimum use of the power system is ensured at all times.

Figure 7 shows a possible scenario for an integrated substation, each protection relay is capable of performing its function in a stand-alone mode but also provides information to the substation computers to enable them to take intelligent programmed decisions on the power system.

The modern integrated digital protection relay provides the key to superior protection, enhanced system control and accurate post fault analysis.

#### Acknowledgements

The authors are indebted to Eskom Engineers for providing information on Alpha and Beta Substations control philosophy — particularly Mr. T.N. Carolin and also to their colleagues in the Reyrolle Organisation in the UK and South Africa.

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#### MR H D BECK: EAST LONDON

Mr President, I was delighted several months ago when Reg Rosen asked me to contribute to the discussion on the paper which he has just presented today with Mr Malcolm Wheatley.

The task seemed simple. A quick scan of the advance copy of the paper, consult the standard works on the subject and then jot down a few relevant comments.

My feeling of elation diminished when I received the advance copy of the paper. Not, I must emphasize because there is anything wrong with the content or presentation of the paper. It is just that the task is a little more complicated than it seemed at first.

Examination of the standard works produced two extracts, both from a book first published in 1945. These are worth repeating here:

"The first essential of any protective scheme is simplicity; but this is a relative term and can only be assessed in the light of knowledge of what is required of the scheme . . ." and

". . . modern protective gear and practice must appear to be a mass of widely different devices and systems, seemingly, and in many cases actually, intended to serve the same purpose."

I consider that these comments are still relevant.

Just as oil circuit-breaker technology has been challenged by vacuum and sulphur hexafluoride switchgear; so a change has been evident in the technology used for what may be considered to be ancillary or associated functions. By these I mean protection, alarm annunciation, metering, indication etc.

It is a natural human tendency to resist any change. This applies in the field of technology in general and electrical engineering in particular. Any number of reasons, either real or imagined, are produced to justify this resistance. Quite often, the

fears or uncertainties do not materialise. This is the case for SF<sub>6</sub> switchgear has given good service results.

In East London, a 66/11 kV substation using solid-state protection equipment on the 11 kV feeder panels was commissioned last year on behalf of the South African Development Trust. Apart from a problem with one of the protection units, which has been rectified by the supplier, the equipment has performed well and has now been handed over by the City of East London to the Ciskei Department of Works. Any of the following remarks which are not fully supportive of the present wave of solid state digital technology sweeping through the industry should therefore not be regarded as personal prejudice or resistance to change.

In the paper the authors deal with three systems or classes of equipment: transformer protection, current differential protection and integrated substations.

Based on the information in the paper, I share the authors' enthusiasm for the digital Duobias transformer protection equipment which they have described. A system which provides current compensation for ratio and phase to eliminate the need for external interposing current transformers will certainly simplify design, specification, installation and commissioning.

I note that one of the motivations which led to the development of the digital equipment was the expense of the previous unit due to the high nickel content. While the digital relay has additional features, the authors are requested to comment on price of the digital compared to the analogue Duobias relay. A percentage would be acceptable. Similarly, the authors are requested to comment on price difference for a representative transformer protection panel with similar protection features using either the digital or analogue Duobias relay.

The current differential protection equipment described in the paper has a number of advantages over the pilot wire feeder protection systems which have been available to date. An interesting feature is the use of the new unit on multiterminal lines. Possibly the authors could describe briefly this feature. Is the new equipment intended as a successor to your Company's existing Solkor pilot wire feeder protection equipment? Again could a price comparison be given?

In the third section of the paper the desirable features of the two protection equipments previously described are enumerated and the "Integrated Substation" is dealt with. This is mentioned in the context of two major Eskom substations which I would imagine are intended to deal with very large power trans-



Mr H D Beck, East London

fers. Would the integrated substation concept described in the paper be economically appropriate for any but the largest of the municipal substations in South Africa?

The electric power supply industry deals with loads or power transfers ranging from thousands of MV.A to units of kV.A. At each level of power transfer there is an economic level of protection.

Are suppliers losing sight of the need for basic protection equipment required for municipal distribution purposes — relays which are reliable, stable, accurate with discrimination and also maintenance free? The author's comments are invited.

Finally, Mr President, I would like to thank Reg Rosen and Malcolm Wheatley for presenting an interesting and thought provoking paper.

#### References:

- (1) The Protective Gear Handbook by M Kaufmann. Sir Isaac Pitman & Sons Ltd.
- (2) Messrs. N E I Reyrolle Ltd. data sheet 6/89 on Digital Duobias Transformer Protection.

#### MR H P WHITEHEAD: DURBAN

Mr President, Mr Rosen is well known for expertise in protection matters and as was to be expected he did not let us down today. Thank you Mr Rosen and Mr Wheatley for giving us a look into the future and giving us an idea of what to expect.

My first reaction to the paper, however, concerned my staff who come face to face with protection equipment in the dead of night, sometimes only by the light of emergency lighting and sometimes only with a flashlight under the pressure of a breakdown and have to determine what protection equipment has operated. Not only do they have to contend with a variety of models, old and new, but a variety of makes as well. I would appeal to manufacturers in this regard to keep the faces of relays uncluttered and easy to read to reduce the possibility of error and I would be pleased to have your comments on this appeal.

Also this new technology requires some training for commissioning Engineers which may not be too difficult for the larger undertakings but this may not be the case as far as the smaller ones are concerned. It seems inevitable that all of us at some stage or another will have to make the transition from the old technology to the new. From what you have said the ... of the old will soon not be affordable. Mr Rosen, could you please let us know whether you have any plans to assist in this regard as the literature is not always that lucid to a first time user — it is fine as a reference once the commissioning methods are understood.

Mention has been made of the hostile electrical environments in substations and the efforts to contend with this. What about the atmospheric environment — is air conditioning required? What sort of maximum temperatures can be tolerated?

Finally, this "integrated" approach seems to me to be only the first step towards full integration. In this case we have a number of processors or computers for each panel talking possibly to a central supervisory processor. Surely the next step is to feed all your measurands from standardised CT's into one processor that does the entire job of protecting our substations and their circuits — with a complete duplicate system as back up if necessary. Would this be another step or too much of a giant leap as we bring "star wars" into our substation?

Thank you.

#### MR RON WEDDERBURN: AFFILIATE

I would like to express my very sincere congratulations to Messrs Rosen and Wheatley of Reyrolle for a very interesting and pertinent paper on integrated protection. At a stage when the cost of providing electricity is increasing month by month we should be considering every means at our disposal for a cost effective supply of electricity.

Unfortunately the actual percentage of the total cost of building a substation which can be saved by reducing the cost of pro-

tection is minimal. Therefore, the economic advantages of going to an integrated substation is questionable.

However, from an operable point of view the integrated substation can achieve a more reliable supply of electricity as both the incoming and outgoing supplies are monitored and controlled by a single overall protection scheme. Selective tripping of circuit breakers is achieved by the transmission of a trip signal to only the necessary circuit breakers in the event of a fault. Of more importance though is the fact that time grading of protective relay responses could be eliminated if the protection of a substation was truly integrated, with a digital communication link linking all the protection into one overall scheme. Could the authors comment and elaborate on this possibility? Do the authors see the evolution of the integrated substation as a long term situation taking 25 or more years to evolve or do they see it as being relatively short, say 5 to 10 years? Could they please comment on this?

This evolution of protection which has been described today could cover every facet of a medium voltage substation from incoming feeders, the stepdown transformer and neutral earthing compensators/resistors to the outgoing feeders. Could the authors comment on the cost effectiveness of this type of protection for a normal municipal medium voltage substation?

Do the authors see any change in the measuring devices in the current and voltage transformers, as modern protection relays should impose far lighter secondary burdens on these transformers compared to the older electro-mechanical protection relays? Do the authors wish to comment on this point?

In closing I would once again like to express my appreciation and I am sure I can include all those present, for a very interesting paper.

#### MR P R ROSEN: AFFILIATE

Mr Harden Beck, you ask for simplicity and I do agree with you and we are starting with a new concept. And really we see the implementation of this concept at higher voltages, probably the initial implementation of this concept at higher voltages i.e. 132 kV and upwards. I think that for people that want minimum cost and simple relays, these electromechanical relays and so on are still available and this technology coming in at the high voltages is going to work its way down and eventually we will see these complex relays — they are complex inside, they are complex black boxes — but in fact to the outside world they are very simple.

We are going through a transition where we still are with the watch with the little escapement wheel that you wound-up, and we are going into the digital watch technology, but in fact it is no more difficult to read a digital watch, than it is to read an analog watch and it is a kind of technology change that is going on and this is the way the world is going.

Harden, you asked for the component cost with the digital and analog transformer differential protection. At a guess I would say that the digital protection would be approximately half the cost of the analog protection if we compared apples with apples and say, right we are going to have a transformer with HV and LV differential protection and we want this annunciation etc. If you wanted a fullhouse of protection the cost would be two to one. On the other hand if you do not need all these features, remember they are always built-in to the digital relay, so you are going to use fewer and fewer features and at the worst though, the digital protection would be no more expensive than the analog protection.

On multi-terminal lines, this is somewhat different, because this multiterminal, this current differential protection that Malcolm described, has been really, at this stage, tailored for the 765 kV 400 Feeder protection and it is approximately 10-times the cost of conventional Solkor. In time it will come down, but at the moment it is very expensive, but remember that it is horses for horses. It was never designed in its present form to protect an 11 kV cable, it was much more designed to protect a 765 kV cable.

The stability of relays, yes these modern relays are just as stable as the older ones.

Howard Whitehead we really hear what you say about the training of engineers with these new concepts and it is tremendously important and side-by-side with the development of these relays we are seriously considering, in fact this is going ahead, because two things are necessary. One is very comprehensive instructions but we had the General Manager of our Division in UK out last week. He had intended attending the AMEU Convention but he had to be back for an important meeting yesterday and today in the UK. He said, however, and he made the remark in Durban which was very very true, that you can have a P.C. and you can have the best manual in the world and you still won't be able to use that P.C., even read the manual, unless someone shows you how, and this is equally important on these modern relays. What we intend doing, is that side-by-side with the manual we'll produce a video tape. You can put this on a video to train people who are going to operate these and they will have a picture of it and show you just how to use it, and then when you see it being done with the manual, people will be able to do it. Without this video it would be an almost impossible task, and we do agree with you there.

The other points that you brought up, the temperature that this modern protection can tolerate. We designed and test for a range of  $-10^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$  and you don't need airconditioning, so it is designed to work in a hostile atmospheric environment as well.

And Howard, you talk about the integrated approach going to one or two computers that control an entire station. Now this is just not possible, it is indeed being done. It was done some years ago by an organisation in Hong Kong, and it does work. They had initial troubles but it can be made to work. You are then talking about total integration and we Protection Engineers are, I think, very conservative people. We don't want total integration. We want separate development. With this separate development we are going to develop each of our relays as a stand-alone relay, so that if the substation computer fails, the stand-alone relay will still protect and you don't lose anything. In fact if you have to remember that a relay, amongst other things, is a very accurate and very cost effective transducer, and with this integrated station you are going to need very good transducers on each feeder. So instead of the transducers rather have the relay which then has its stand-alone capacity, and let it communicate with the sub-station computer. It is a safer way of doing things, and we are dealing with something that is tremendously important and we are not talking about spending a tremendously great extra amount of money. So I think the way we are going, is the way that most manufacturers and most utilities in the world want to go, and yes, we will stick to separate development.

Ron Wedderburn, you spoke about the time scale of these. This is happening very quickly. All manufacturers in the world, my colleague Jeff Cardwell described what his principals are doing, and obviously our principals are doing the same thing. All other firms are doing this.

You are going to see integrated sub-stations certainly within the span of five years time. In five years time you will be offered at maybe 132 kV and upwards, every substation you will be offered will be an integrated type of substation, and the manufacturer will quote you an extra for the conventional control. The standard will be integrated, and that I think will be within five years.

The cost effectiveness — yes, this is going to be cost effective, because it is going to be so much cheaper. As I say, you are paying extra if you want relay control, compared with this type of control on the substation.

The burdens on the CT's and VT's of this modern protection are very low and manufacturers are talking about using unconventional CT's and VT's in their switchgear in order to cut the overall cost and this is quite possible. You won't have to specify 15 VA class 5P15 CT's anymore. You get by with CT's that are very much cheaper and a number of unconventional CT's are already in operation, utilising fibre optic technology where you have a crystal and you pass a fibre optic up through the crystal at your high voltage, be it 675 kV or 400 kV, and this is, at these high voltages, very cost effective and I think this is going to come in, although in GIS gear, the cost of a CT is not very high.

Mr Cardwell, CIGRE is working on it. We've got people at CIGRE, we know what is happening there. All manufacturers are very keen to see an International standard for the protocols and software used in communication, but this cannot stop development. We've got to go ahead and for this reason all the software, at the moment being written, is highly modular and it can be adapted to suit any international standard, because this must be it, it is absolutely essential.

Users must be able to buy items of equipment from different manufacturers and buy equipment from one manufacturer and extend it with equipment from another manufacturer, and you must have the same protocol. This is very necessary and it has to be done otherwise things would be impossible. But we still see that this is the way the world is going, and it is going to go that way, not because manufacturers force it, but because it is right, it gives engineering excellence at minimum cost and that is what electrical engineering to us is all about.

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## DEVELOPMENTS IN CONDITION MONITORING OF HIGH VOLTAGE POWER EQUIPMENT

By: G R Cardwell

Manager, Group QA & Technology, Brown Boveri Technologies (Pty) Ltd.

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### MR FLU DANIEL: PRESIDENT

Geoff Cardwell has spent most of his life in Cape Town and undertook all his university education just around the corner at UCT. He thus feels privileged to address the AMEU in his home city.

After completing the B Sc in Electrical Engineering in 1966 he spent two years in the UK on an AEI (now GEC) Graduate Fellowship. He returned to UCT to do an M Sc with the aid of a CSIR Bursary.

His first job in 1971 was with Eskom on power station sites commissioning high voltage electrical equipment and associated control and protection circuits. Two years later he transferred to the Protection Design Section of the Electrical Engineering Department at Eskom's Head Office in Braamfontein. He felt the urge to return to Cape Town once more and completed the MBA programme at UCT in 1976.

After a short spell with a local contracting company he returned to Eskom as Senior Quality Assurance Engineer on the Koeberg Nuclear Power Station Project and spent two years on site.





Mr G R Cardwell

In 1983 he left Eskom to join ASEA Electric as their Company QA Manager and has survived a number of organizational changes including the recent merger between ASEA and Brown Boveri. He now has wider responsibilities covering BBT's Group QA and Technology programmes which include new product development and import replacement projects. One area of particular interest to Geoff is electrical insulating materials and you will hear more about that now.

#### MR G R CARDWELL

##### Synopsis

Electricity supply authorities are paying increasing attention to the performance of high voltage power equipment on their networks. The decline in electrical energy growth patterns coupled with the rising costs of replacement plant have caused suppliers and users of power to take a closer look at extending the life of existing plant as well as refurbishing older plant.

Unfortunately technological developments in sophisticated energy conversion equipment and undesirable harmonic pollution of the supply network, have placed additional burdens on the insulation systems which determine the integrity of all high voltage apparatus. It is therefore useful to know the condition of the insulation system before making decisions on maintenance outages or plant replacement.

This paper reviews insulation system stresses found in service, general integrity tests and the trends and recent developments in condition monitoring of equipment such as rotating machines, switchgear, power and instrument transformers, power capacitors and surge arresters. Measuring systems based on dissolved gas analysis, partial discharge detection, dielectric power factor as well as pressure and temperature devices are discussed and some currently available monitoring equipment is described.

#### 1. INTRODUCTION

The requirements for condition monitoring of high voltage power equipment hinges mainly around the health of its electrical insulation system. Electrical insulating materials is one facet of the power electrical industry which has not enjoyed adequate attention from electrical engineers in this country. Suppliers and users of this type of equipment have relied heavily on overseas technology and the free availability of imported materials.

A general overview of the behaviour of insulation systems in service and the various tests to evaluate their performance is given. Examples of condition monitoring apparatus for high voltage equipment including automatic control and the use of expert systems are described and future applications are considered. The paper highlights the need for further development

work in the area of sensors and transducers. Ways and means to raise the level of local expertise in these related areas should be investigated.

## 2. INSULATION STRESSES AND AGEING FACTORS

### 2.1 Equipment loading and design parameters

The insulation system is chosen to satisfy the performance requirements of the electrical equipment in service. The loading of the equipment thus has a major effect on the insulation stresses. In normal steady state operating conditions the electrical and thermal stresses on the insulation materials should be well within their capabilities. In most cases electrical equipment is operated well within its design limits. The question of whether equipment can be loaded above its nominal rating for short periods of time is the subject of much debate and investigation at present. In some cases the insulation system stressed to its thermal limit will recover its initial properties but there will be a reduction in the overall life of the equipment. A guide published as IEC 354 is based on theoretical considerations of chemical reactions taking place in the solid and liquid insulating materials. The validity of these theoretical models depends entirely on an accurate measure of hot spot temperature within the insulation system. This is not easy due to the variations in material consistency and also in the processing and assembly stages. Transformer manufacturers can make use of fibre optic measuring systems where the fibre optic sensors are placed within the windings during manufacture. The design calculations should provide the most likely places where the hottest temperatures will occur.

### 2.2 Supply network characteristics

The increasing complexities of electricity supply networks, including the use of reactive compensation equipment and the effects of consumer loads has resulted in undesirable harmonic pollution and other transient effects being fed into the network. These effects, together with lightning impulses and other abnormal situations following network fault conditions, have placed additional burdens on the insulation systems in high voltage equipment.

Overtages caused by switching surges during normal operation of equipment on the network can also cause additional stresses above those anticipated from design requirements and given parameters.

### 2.3 Ionisation and partial discharges

Ionisation is a phenomenon occurring in all dielectric materials when sufficient voltage is applied across the material. Ionisation can lead to dielectric breakdown and is normally preceded by partial discharges or the common visible form of surface ionisation known as corona. The ionisation and resulting corona is not a property of the material itself but is due to the assembly of the insulation system and is aggravated by certain electrical, physical, chemical or mechanical factors in the material.

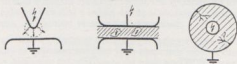


Figure 1. Examples of partial discharges.<sup>10</sup>  
1) Corona 2) Voids 3) Trees

In solid insulation systems it is essential to eliminate air or gas from within the insulation layers. It is thus necessary to impregnate solid insulation systems such as paper for transformers and cables with suitable oil of adequate dielectric constant to prevent the voltage stresses in the air voids from causing ionisation and breakdown. The distribution of electrical stress through the insulation is seldom uniform and tends to be concentrated around the conductor at the highest potential. It is thus necessary to grade the insulation for certain types of electrical equipment with the highest dielectric constant material in the region

of the highest electrical stress. This will tend to shift the voltage gradients from the high stress areas to those with the lower dielectric constant materials.

Ionisation can be detected in insulation systems by measuring partial discharge levels. The voltage levels associated with ionisation are termed partial discharge inception voltage (PDIV) or extinction voltage (PDEV) in the case of a decreasing voltage level. The presence of ionisation can signify impending failure of the insulation. It is thus very important to eliminate all factors which can contribute to ionisation during the processing, assembly and operation of the electrical equipment. Insulation system designs must also ensure that degradation of the insulation cannot take place within allowable limits of operation of the equipment.

#### 2.4 Electrical ageing and breakdown

Electrical ageing takes place when the electrical stresses in an insulation system cause ionisation and partial discharges to occur at operating voltages. Partial discharges should not occur at operating voltage but overvoltages can produce partial discharges which do not disappear at the normal voltage. The partial discharge extinction voltage (PDEV) is thus important when considering electrical stress as an ageing factor.

Environmental effects such as humidity, pressure changes, dust, chemical fumes etc. will contribute to the early onset of partial discharges. It is thus important to eliminate these effects particularly when the equipment is operating in harsh environments.

#### 2.5 Thermal ageing and degradation

The insulation of electrical equipment is affected by many factors and temperature is probably the most severe of the ageing factors. There is an inter-relationship between the life expectancy and the operating temperature of a transformer. A law describing this relationship was put forward by Montsinger in 1930 and in general terms states that an increase or decrease in operating temperature of 6–10°C, depending on the insulation material, will result in a doubling or halving of the ageing rate of the insulation. The ageing process or thermal degradation is assumed to take place in a homogeneous system. The insulation materials should be uniform and the ageing mechanisms should be first order chemical actions like the chemical breakdown of constituents including depolymerisation etc. Other important factors include the presence of water and oxygen in the insulation system.<sup>9</sup>

The ageing process consists of thermo kinetic degradation of the macro molecules in the materials. The bonds between these molecules are broken due to the vibrational energy caused by the elevated temperatures of the many atoms in the group.

The extent of decomposition of the macro molecules is given by the Degree of Polymerisation of the cellulose. This gives a measure of the deterioration in the insulating material properties and the formation of ageing products. The Degree of Polymerisation (DP) thus is an important parameter for assessing the extent of ageing of the cellulose material. The factors associated with the DP are illustrated in the following diagram.

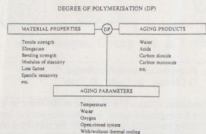


Figure 2. Factors influencing the Degree of Polymerisation.<sup>9</sup>

#### 2.6 Mechanical and environmental factors

The insulation system is invariably stressed to some extent by mechanical forces occurring during the operation of the equipment. Mechanical stresses can also be a major consideration

during the manufacturing and processing stages in production. Residual mechanical stresses will obviously impact on the life of the insulation system in service.

Mechanical stresses are of major consideration in the design of rotating machines. Special precautions have to be taken to secure the windings in the rotor and stator cores. Apart from vibration during operation, high resonant frequency stresses from poor design or manufacture can cause the insulation system to fail.

There are also mechanical stresses involved in static plant such as transformers. Dynamic loads such as arc furnaces require transformers to have special winding support systems. System network transformers also need adequate supports to handle short circuit conditions occurring on the system. All windings are clamped under a positive pressure and if this changes drastically during operation the insulation system will also suffer. When performing functional tests on insulation systems it is thus also necessary to include mechanical stress factors.

#### 3. INTEGRITY TESTS ON MATERIALS AND SYSTEMS

The following general description of tests which can be performed on insulating materials and systems is based on the series of applicable IEC publications. Reference to the appropriate IEC publication should be made for detailed information. The more common tests are described in the following sections.

##### 3.1 Visual inspection

This is obviously the basic type of evaluation procedure. Factors which could provide an indication of the insulation condition include the colour and colour changes experienced in service. Deposits of any contaminating substance such as oil or chemical powders, together with high humidity could damage the surface of the insulation. External defects or failures can also reveal problems and where these are significant the dimensions and size of any defect or area can be measured to determine the severity of the fault.

##### 3.2 Electrical tests

The most basic test for an insulating material is its insulation resistance. However, most insulating materials have a very high electrical resistivity and thus the values of insulation resistance are also very high and are subject to large errors unless methods and procedures are carefully controlled. Resistance measurements can be made between any two conducting parts of the electrical equipment. Specific measurements of insulation resistance are volume and surface resistivity. A change in resistance values during service life could be used to indicate changes in the quality of the material or certain properties or the effects of contaminants such as moisture.

The dielectric loss or dissipation factor is a standard test for all insulating materials unless a perfect gas insulation is being used. A change in the dissipation factor or tan delta during the life of the equipment is a good indication of the deterioration of the insulation system. The dielectric constant or permittivity of the insulating material is a basic property which should not change significantly during the life of the equipment. This can be a useful test when designing new insulation systems to ensure that the electrical stress distribution is within acceptable limits.

In all cases a service voltage proof test is carried out on the electrical equipment to ensure that the insulation system will meet the specification. Voltage levels above service voltage are limited for a certain time interval as precautions must be taken to avoid overstressing the insulation system which could lead to possible detrimental effects later in use. Overvoltage tests to breakdown are often conducted on new insulating materials and systems to establish limits of operation or when accepting new material supplies where samples are tested from a batch to ensure that the material meets specification.

The detection and measurement of any partial discharge activity during the service and overvoltage proof stress tests is an important indication of the health of the insulation system. Various methods are used to measure partial discharges including the use of radio interference meters and acoustical detectors such

as microphones or transducers which can be used to locate the source of discharges. Partial discharges may be characterised by quantities such as charge repetition rate, amplitude and inception and extinction voltage. Special equipment is used to measure the frequency response to give statistical distributions of partial discharge profiles for the particular equipment.<sup>3,8</sup>

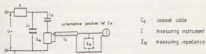


Figure 3. Basic partial discharge measurement to IEC 270<sup>10</sup>

A major problem associated with measurement of partial discharges is the noise or background interference levels from other sources. The interference can be external from other electrical equipment or even internal to the supply source of the partial discharge measuring device. In all cases arrangements must be made to reduce the background noise levels such as a Faraday Cage for the test area so that discrimination can be easily obtained at the lower values of discharges.

### 3.3 Physical and mechanical tests

The basic physical tests normally done on insulating material include thickness, density, and changes in dimensions to determine shrinkage or elongation. Other physical properties which can have a bearing on the performance of insulation materials in service include hardness, elasticity or stiffness and porosity where impregnation is required.

Other more specialised mechanical tests for endurance in service include vibration and impact tests. These tests are required where the equipment has to withstand seismic forces, in particular where nuclear power plant operation is concerned. Operational tests are normally performed on the prototype equipment to verify that it will withstand a certain number of operations equivalent to the required years of service life.<sup>5</sup>

### 3.4 Chemical tests

The basic chemical test performed on most insulating materials is moisture content. Water consists of polarised molecules which act as conducting paths and could lead to electrical breakdown. Conductivity tests are performed on certain solids and liquids to indicate the leakage current or dielectric loss. For cellulose materials the Degree of Polymerisation gives a direct indication of the decomposition of the cellulose molecule and can show the extent of ageing of the cellulose material.

The more specialised chemical tests include gas chromatography, atomic absorption, high performance liquid chromatography, mass spectrometry, infra red spectrophotometry and x-ray diffraction. Most of these tests are only performed where detailed evaluation of the composition of insulating materials is required. Gas chromatography can be performed on site with fixed or portable apparatus depending on the power utility's requirements.<sup>6,11</sup>

### 3.5 Ageing tests

Ageing tests are done to establish the suitability of an insulation system in performing its intended function for a specific service life. The conditions for simulating the process of ageing are controlled in a laboratory environment to be as close to the actual service conditions as possible. In order to obtain meaningful results within a reasonable period of time the ageing factors are increased in intensity or the time scale is shortened to speed up the reactions and provide a result to within a reasonable degree of confidence. The mechanisms of ageing of the insulation systems and the procedures for comparing the ageing factors in the tests and in actual service are described in IEC 610. The ageing mechanisms must be carefully controlled as the more the ageing stresses are intensified or the tests accelerated, the greater will be the risk of errors in simulating the conditions found in service.<sup>6</sup>

Electrical ageing tests are performed when electrical stresses are

considered to be an ageing factor. Electrical stress is important as an ageing factor when partial discharges are present or could develop at operating voltage. Discharges at overvoltage are important if overvoltages occur frequently or if the partial discharges do not extinguish at normal operating voltage.

The amplitudes and time distributions of partial discharges are powerful diagnostic tools. Distributions can be compared between the test and service voltages. Varying the voltage will produce different results and the partial discharge amplitudes and distributions will vary depending on the geometrical location of pulse sites and the void dimensions. Typical partial discharge characteristics are shown for different types of void or defect.

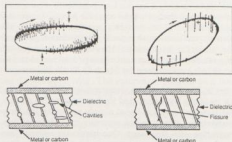


Figure 4. Typical partial discharge characteristics<sup>8</sup>

Mechanical ageing tests are performed when insulation systems are subjected to mechanical forces during service. This is applicable to rotating machines, switchgear and certain types of transformers where short circuit forces can be a significant factor during the service life. The mechanical stress factors applied must be representative of the stresses occurring during the service operation. Undesirable stresses such as occur during resonance between mechanical parts must be avoided.

Thermal ageing tests are performed to determine the extent of degradation of the insulating material properties. Thermal ageing involves the exposure of the material to temperatures higher than expected in service and above the materials' maximum thermal limit. The Arrhenius relationship is used to check the insulation performance by plotting the results for the logarithm of time taken to reach a certain degree of property change against the reciprocal thermal dynamic absolute temperature. The Arrhenius relationship can be used to calculate or the thermal endurance graph used to estimate ageing times for various exposure temperatures. A procedure for thermal evaluation of insulating material is given in IEC 216.<sup>2</sup>

### 3.6 Functional tests

The complete electrical equipment should be subjected to a series of functional tests during its development stage. Included will be tests described in the above paragraphs. The main objective is to ensure that the insulation system will withstand all service conditions including a certain degree of abnormal operation or harsh environment or corrosive atmosphere.

Type tests on electrical equipment include verifying its capability to withstand specified fault conditions without causing any damage or deformation to the equipment or its future performance in service. Service stresses are applied and the results accumulated to determine the acceptability of the product for the customer.<sup>7</sup>

## 4. IN SERVICE MONITORING OF EQUIPMENT

Some of the more recent developments in monitoring techniques for various types of electrical equipment are given in the following sections. Examples are taken from recent technical journals and brochures and some diagnostic equipment described may not be commercially available yet.

### 4.1 Rotating machines

A local project initiated some years ago under the auspices of the Rotating Machines Working Group of the High Voltage Co-

ordinating Committee of the CSIR has established an Insulation Merit Assessment Scheme for HV machines. This scheme was originated by the CSIR and developed with input from various members of the Working Group. The scheme is based on the measurement of capacitance and tan delta or dissipation factor of the motors' insulation system. The detection and measurement of partial discharges is also included and these factors are correlated to show the extent of deterioration of the insulation. The Scheme has demonstrated that it can identify dirty or wet machines and also insulation weakness so that remedial action can be taken.<sup>12</sup>

In conjunction with this Scheme a National Motor Fault Register is being assembled. A large number of machine failures are included from the questionnaire returns submitted by the machine repairers. Unfortunately it has not been possible to show a correlation between the decline of the machine Merit Number and the ultimate failure of the particular machine. There has also been little correlation between peak partial discharge magnitude and insulation deterioration. However, the measurements involving tan delta and capacitance have proved useful and the Register is being maintained by Mr A D W Wolmarans.

A number of North American, Japanese and UK utilities and research institutes have proposed various systems for measuring insulation deterioration based mainly on partial discharge measurements but also including spectrum analysis from impedance variation with frequency. One particular scheme developed by Ontario Hydro in conjunction with the Canadian Electrical Association involves the on-line measurement of partial discharges obtained from capacitor couplers placed in the winding slots and in the winding overhang area.<sup>13</sup>

This method gives correlation between the type of failure mechanism and the effects on discharge levels based on load and temperature variation. Ontario Hydro have been able to reduce their major winding repair rate from 6 to 0,15 windings per year as a result of regular monitoring of generator winding partial discharge levels.<sup>13</sup>

A different approach is based on impedance balance between a number of identical coils or phases which make up the machine windings. A Surge Comparison Tester compares the impedance of the windings to detect any faults. The instrument applies a short time surge to a matched pair of windings by a capacitor discharge. The voltage decay pattern for each of the two windings is displayed on a screen. If there are no faults in the windings and the impedances are balanced the two patterns will be identical and coincide. If one of the windings has a fault or defect the oscilloscope pattern will give a different trace and a double line will appear. The advantage of this type of test is the ability to compare turn to turn and phase to phase insulation whereas most other insulation tests are for winding to ground insulation.<sup>14</sup>

Methods for measurement of partial discharges in generators using the resulting radio frequency signals that are located and measured by high frequency testing techniques are also being developed. The monitoring system uses coupling units on each phase in combination with surge arrestors and protection capacitors to detect the RF voltage. Coupling arrangements between the stator and rotor are also included so that information can be obtained while the machine is in operation.<sup>15</sup>

A comprehensive summary of all the diagnostic tests which can be used for inspection and continuous monitoring of rotating machines is given in the paper by A Kelen from the May 1987 CIGRE Symposium in Vienna on New and Improved Materials for Electrotechnology.<sup>16</sup>

#### 4.2 Switchgear

Apart from the routine and special maintenance activities as recommended by the suppliers and carried out to varying degrees by the users of switchgear, there are relatively few specific tests available to check the integrity of the insulation systems. Most switchgear apparatus have inbuilt trip counters or devices to indicate the number of operations. A fault current measuring device can be incorporated in the protection circuit which integrates fault current over a number of fault clearing operations.

This gives an indication of the breaker contact condition for planning future maintenance outages.

The solid insulation system inside the switchgear can be tested by the usual routine and type tests applicable to the equipment. The internal liquid or gas insulation can also be tested during a maintenance outage. On-line checks or tests include oil level indicators and SF6 gas pressure or density monitors which can be used to alarm or signal remote control centres.

Techniques are available to detect partial discharges in switchgear as for other types of equipment. There are, however, limitations to the extent of measurement and accurate determination of the source of discharges while the equipment is energised. The magnitude of discharges may not be possible to determine to any accuracy but knowing their location will assist in deciding on remedial action.

Partial discharges also give rise to acoustic emissions which can be detected with ultrasonic detection devices. As the ultrasound is attenuated in solid insulation materials, this technique is used for location of exposed discharging sources. Different designs of detector are used for metalclad switchgear and outdoor switchgear. A hand-held ultrasonic detector equipped with a parabolic reflector and microphone is aimed at the suspected source of partial discharge and the signal intensity indicates the location to the operator.<sup>17</sup>

A system for continuous monitoring of metalclad switchgear has been developed by Ontario Hydro. Partial discharge sources and surface tracking are monitored both electrically and acoustically. This enables false alarms to be reduced by eliminating extraneous noises while maintaining the sensitivity to partial discharges. This system has enabled old metalclad switchgear installations to be monitored to give warnings of insulation deterioration and prevent failure. A set of sensors is installed in the switchgear panels and an ultrasonic microphone and a radio frequency antenna are used to detect the partial discharge activities. The cell monitor uses a strip chart recorder to show the amplitude of partial discharge activity. The older switchgear panels can be fitted with these cell monitors on a rotation basis to identify where partial discharges could cause failure. Repairs to switchgear can then be carried out under a planned outage programme.<sup>18</sup>

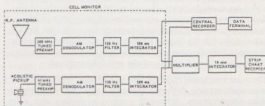


Figure 5. Block diagram of prototype Metalclad Monitor<sup>18</sup>

A generally accepted technique for detecting hot connections and possible impending failures in outdoor switchyards uses infra red thermography to measure the infra red radiation from an area exhibiting higher than normal temperature. The system is based on the increasing temperature in a particular component prior to failure. It has a very versatile application and can also be used for identifying weak components in electronic printed circuit boards. The equipment has been developed for specialised applications for substation monitoring including identification of transmission line component problems.

#### 4.3 Transformers and reactors

A good overview of the diagnostic methods used for transformers in service is given in the General Report of Study Committee 12 from the 1986 CIGRE Paris Session.<sup>20</sup> The normal surveillance techniques such as dissolved gas analysis (DGA) warn of faults which develop over a relatively long period of time. Although it is impossible to predict an instantaneous fault, the following techniques should provide some measure of detection and warn against faults that develop over a few days or weeks. The use of on-line DGA equipment is gaining accep-

tance and this system can be used where suspect transformers have been identified. High performance liquid chromatography has been introduced to identify the presence of furanes and furfuranes in the oil. These give a measure of the degree of degradation of the oil and paper insulation system.

Four techniques to monitor transformers in service, namely hot spot detection, partial discharge measurement, dissolved gas analysis and mechanical changes are described in some detail in the 1986 CIGRE Proceedings on Transformers.<sup>23</sup>

Manufacturers in general consider that the use of thermal calculations of winding temperatures are too inaccurate to base decisions on transformer loading and remaining life. Much depends on the type of cooling systems involved and whether it is possible to instal hot spot detectors in the locations of the most likely high temperature. Hot spot measuring devices have increased in reliability and their use is recommended in the new revision of IEC 354 on Loading Guide for Oil Immersed Power Transformers. The use of conventional winding temperature indicators of the thermal image type have a possible error at overload of 15°C which gives an equivalent error of four times the assessed loss of life under overload conditions.<sup>24</sup>

The measurement of partial discharge and determining the location of sources has been the subject of many papers over recent years. Different methods are used to measure the level of partial discharge. A common approach is to use the acoustic signals and sensitive microphones to identify the source through triangulation techniques from different places on the transformer tank. This technique is used by manufacturers to locate possible sources during the final testing of transformers before delivery.

Mechanical changes in the active part of the transformer can give an indication of possible future problems when the transformer is subjected to short circuit forces. Experiments using low voltage impulse and frequency response analysis techniques have been used to check the winding clamping arrangements and detect any conductor movement in service. Interference problems cause difficulties in using this approach for on-line monitoring of clamping pressure.

A project undertaken by the CEGB and the Electricity Council Research Centre in the UK to predict the remaining life of 132 kV transformers involves the measurement of a number of factors. These include moisture and acidity, DGA and furfuraldehyde as well as breakdown strength, resistivity and tan delta of oil samples collected from transformers in service. In addition the equipment measures high voltage DC resistance and partial discharge characteristics of the transformer insulation during outages. The aim of the project is to screen a large number of transformers on a regular basis by cost effective methods on site using unskilled staff. Transformers identified as suspect would then be subjected to a full programme of tests and evaluations.<sup>25</sup>

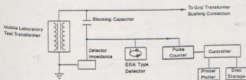


Figure 6. Partial discharge measuring system for 132 kV transformers<sup>25</sup>

#### 4.4 Instrument transformers and bushings

The relatively high number of instrument transformer failures experienced by many utilities worldwide has focussed attention on methods to monitor and prevent failures in service. Apart from certain makes of instrument transformers which have shown design weaknesses, the major cause of failures are high frequency transients and harmonic pollution on the supply system. These transients and harmonics can be caused by isolator switching and in some cases switching of capacitor banks and static compensator equipment without the proper filters being fitted.

The quality of the insulation system is normally measured by tan delta tests before despatch. Instrument transformers are subjected to impulse voltage tests and chopped wave tests and the possibility of partial discharges can be determined by measuring any increase in dissolved gas in the transformer oil. Allowable increases in each combustible gas are of 1 or 2 ppm in an oil sample taken 3 days after the test. Good laboratory facilities are needed to measure increases of such low ppm levels.<sup>27</sup>

As for other high voltage equipment, the measurement of partial discharges is an accepted technique for identifying faults in instrument transformers. Measurements have proved difficult in outdoor switchyards due to the high levels of electrical noise and other interference. The measuring systems must be able to suppress or eliminate the various sources of electrical noise.<sup>28</sup>

Ontario Hydro in Canada have developed a fault detecting device for continuous on-line monitoring of substation equipment based on partial discharge detection. The apparatus was developed after a number of catastrophic CT failures in service. It was necessary to develop an on-line measuring device as failure could occur after a short interval from the start of partial discharge activity. The equipment consists of a fault anticipator which can detect and identify a partial discharge source in a noisy substation using a high frequency current transducer in the main current transformer ground connection. The outputs from a number of transducers connected to the CT's in the substation are fed into a multiplexing processor which can identify the particular unit with partial discharge signals. Records of CT failures indicated that system disturbances such as lightning and repetitive breaker operations occurred 12 to 24 hours prior to explosive failure. Extreme power line carrier interference was also noted a few days prior to a CT failure.<sup>29</sup>

The Tennessee Valley Authority (TVA) has also experienced a large number of catastrophic CT failures. They have done many tests on CT's using various measurements based on power factor and capacitance of the insulation system, to identify CT's likely to fail. Temperature effects are taken into account and compensation for the estimated internal temperature is used for power factor readings according to a correction curve. TVA also use the on-line hydrogen monitor developed by a Canadian company. The hydrogen content of the oil in the CT is monitored along with the power factor and capacitance to establish trends. Although the hydrogen readings are somewhat inaccurate, the instrument can tell when significant increases in hydrogen levels occur to give a warning to the substation personnel. Where possible, pressure transducers are mounted on the drain valve of the CT to monitor oil pressure, build up if the CT develops gas. TVA also use the partial discharge monitoring scheme developed by Ontario Hydro as described above.<sup>30</sup>

TVA have done a number of measurements on CT's on their system. In one case a CT fitted with a hydrogen monitor indicated an increase in hydrogen from 240 ppm to 1000 ppm in the space of one hour. Using the methods described, TVA have been able to prevent catastrophic CT failures in a number of their substations.<sup>31</sup>

Bushings are in many ways similar to current transformers with oil/paper or resin/paper insulation systems. In some European utilities, bushings have been fitted with an oil sampling device which has allowed oil tests and dissolved gas analysis to be performed. Special precautions must be taken when sampling oil from bushings as in most cases the oil volume is relatively small. Only specially trained staff should be allowed to take bushing oil samples. If the moisture or gas content in the oil is above normal, then bushings should be returned to the workshop for repressing and vacuum filling with new oil.

#### 4.5 Power capacitors

The monitoring of power capacitors installed on the supply network is usually incorporated in the protection schemes for the capacitor banks and/or the separate capacitor cans. The individual capacitor cans are subjected to the normal series of electrical tests prior to despatch. The capacitance of each can is measured and these values are used to ensure that the capa-

ditor bank phases and subdivisions of phases are properly balanced in service.<sup>34</sup>

Capacitor cans can be fitted with internal or external fuses depending on customer preference and application in the power network. Internal fuses offer advantages as the small unbalanced current for a single fuse failure will not trip the bank protection. External fuses have the advantage that it is easy to identify the failed capacitor which can be replaced in a short time. Developments in polypropylene materials for all film capacitors allow for self healing of small shorted areas in the individual elements.<sup>35</sup>

Like other high voltage power equipment, capacitors also exhibit partial discharges where the insulation is over stressed. The technique of acoustic emission has been used by a Polish utility to measure the level of partial discharges in high voltage equipment including power capacitors. The acoustic emission method allows the source of the partial discharge to be located and also has the advantage of not being as sensitive to electromagnetic interference from other sources.<sup>33</sup>

#### 4.6 Surge arrestors

The accepted method for monitoring the condition of gapless metal oxide surge arrestors in service is to measure the leakage current and determine the resistive component which will give an indication of the health of the arrestor. At power frequency voltages the capacitive leakage current will be the dominant factor. When the resistive component increases it indicates a power loss in the arrestor which in turn generates additional heat. If this heat energy becomes excessive, thermal instability will result which could cause failure of the arrestor.

The leakage current detector can be used in conjunction with a surge counter which records the number of surges through the arrestor elements. The leakage current analyser measures the increase in harmonic distortion due to the resistive component of leakage current.<sup>36</sup>

### 5. MICRO PROCESSORS AND EXPERT SYSTEMS

The application of micro processor based surveillance systems is becoming a reality in the larger supply utilities for monitoring substation equipment and providing automatic control features and information to the network control centre. It is becoming economically justifiable to use micro processors in comprehensive schemes to monitor key equipment in service.

Although the sensors required are generally expensive items, micro processors are relatively cheaper than recording devices and can manage a larger number of inputs. The micro processor output can be arranged to provide system operators with the necessary information to take action or else can be linked directly to the control and protection systems to provide automatic disconnection of suspect units before failure. Electrical power engineers may be reluctant to rely on computer based systems to control equipment on the major networks, however, micro processor based schemes have been used for some years already in the control and protection field, particularly where network parameters have become complex.

Sensors and transducers need to be further developed to become more reliable and more cost effective. However, examples of available equipment described in the previous sections show that some sensors have already been tried and tested in the field. A great deal of development work is currently in progress in the utilities and manufacturing organizations overseas. Digital techniques are also being investigated which should make the surveillance systems more reliable and cost effective.

A Japanese utility and a manufacturer of gas circuit breakers have together developed an on-line monitoring system for large gas insulated substations. Sensors for the monitoring of partial discharges are installed with fibre optic coupling to the main control circuits. Insulating gas pressure or density monitor signals are also incorporated in the substation control circuit. Other mechanical type monitoring systems include operating time and hydraulic system monitoring to verify that the breaker is mechanically sound.<sup>38</sup>

A system developed by a US manufacturer is called Transformer Monitoring System (TMS). The TMS is installed in a control cabinet next to the transformer and linked to a host computer over a fibre optic link and telephone lines. The inputs to the TMS, based on available sensors, include top oil temperature, winding current, relative corona or partial discharge, gas in oil analysis and various status inputs on the oil cooling system. The TMS system is commercially available and can be extended when new or improved sensors, transducers and signal conditioning equipment become available.<sup>37</sup>

The above examples indicate that the use of microprocessors for on-line monitoring is becoming accepted by the larger utilities. It is envisaged that these microprocessor based systems will develop into expert systems over the next 5 to 10 years. The

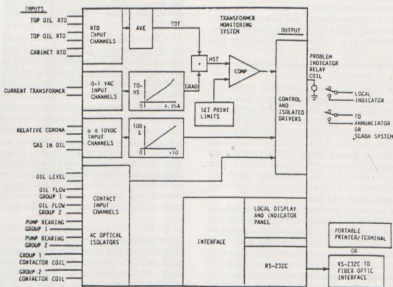


Figure 7. The Transformer Monitoring System (TMS) functional diagram<sup>37</sup>

expert systems will be designed to ease the burden on system operators and provide adequate warning or even automatic disconnection of suspect equipment prior to failure.

## 6. CONCLUSIONS

There is a definite trend in utility organizations to take greater interest in the condition of high voltage power equipment on their networks. Although periodic monitoring of equipment and proper maintenance activities will prevent a large proportion of failures in service, a combination of older equipment and undesirable network overvoltages and harmonics has shown that periodic monitoring will not always identify a potential failure.

The development of on-line monitoring equipment has been in progress in larger utilities overseas for some years now. It is anticipated that local utilities in South Africa will take note of these developments. One area requiring further attention is the design and development of reliable sensors and transducers for partial discharge detection and dissolved gas analysis.

The use of micro processor based systems has already been accepted in the field of substation control and protection. It is thus a logical extension of this application to provide on-line monitoring of the individual items of equipment. It is anticipated that an on-line monitoring system will detect at least 50% of the failures at an early stage so that suitable action can be taken to prevent costly outages and repairs. The cost of the presently available monitoring systems should decline with further development work on sensors and transducers making use of digital techniques where possible.

An area of concern with regard to equipment insulation in general is the almost total dependence of our local power supply industry on imported materials and technology for internal electrical insulation systems. Although local capabilities in the area of application and manufacture of complete equipment have increased over the past few years, the materials technology is still provided by overseas suppliers. It is proposed that organizations such as the AMEU, Eskom and the larger equipment suppliers address this issue with a view to developing skilled manpower to exploit our own raw materials. The strategic nature of insulating materials to the power supply network and hence the economy of this country should be sufficient motivation to review the current situation and propose a plan of action.

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## MR R A LEIGH: JOHANNESBURG

Congratulations Mr Cardwell on raising various issues affecting the performance, operation and life expectancy of various power distribution equipment, in particular condition monitoring.

Our systems are getting ever larger, with an increasing proportion of ageing equipment. The current scarcity of both loan funds and the ability to service these loans is neatly orchestrated by a central government, or State Treasury, who quite smugly believe they alone know what is good for local authorities, makes replacement of essential equipment ever more difficult.

Fortunately the techniques and equipment mentioned by Mr



Mr R A Leigh, Johannesburg

Cardwell offers distribution engineers a chance to hold the situation pending developments which may permit replacement and further stimulus of our manufacturing industry.

Traditionally most users adopted the time-based maintenance principle but there is ample evidence of the increasing adoption of condition-based maintenance which must now enjoy higher priorities.

Maintenance is often the Cinderella item in an operating budget particularly if a system is fairly modern and where the engineer is beguiled into believing the happy fault free initial years will last forever. When faults inevitably start a rapid reassessment has to be made, techniques introduced, experienced test staff hopefully found, and engaged, and funds urgently found for the purchase of test equipment in order to retain a good record and image.

The change in approach is difficult to quantify in advance and has to be introduced in stages.

It is most important in formulating a new policy to be clinically objective, and honest, about expectations of obtaining finance, and ones intentions, ability, and degrees of freedom to make use of test results, whatever measures are proposed for monitoring and testing.

Johannesburg Electricity Department are having to do just that following a re-organisation from a multi-discipline structure to the current discreet discipline where a centralised maintenance branch has assumed overall responsibility from a structure having different priorities, emphasis, records and techniques and given the opportunity to start afresh, virtually from scratch. To introduce a modern condition-based maintenance approach and to establish a computerised record and logging system.

Our experience has been that maintenance costs rose noticeably for a short time, held at the higher level for a year or so and then fell appreciably to below the original cost. This could obviously be expected provided the system introduced was sound and people committed to its success.

It was decided not to purchase a commercially available system but to evolve a simple data base programme to handle mainly equipment, locations and description. Relevant tests such as gases in oil, acidities, tan delta, conductivities, etc. can be entered and manipulated. Report sheets are written and are being refined and the hardest part, selling the system to supervisors and workers, is virtually over although inevitably the time based protagonists cling to what they have known.

It is accepted that ageing and loss of life of insulation can be assessed from temperature records, particularly knowledge of the hottest spots, and their temperature as, e.g., only oil temperature is accurately measured in a transformer, the others are simulated or estimated and in any event instrument accuracy

is questionable on transformers. Even if hot spots are carefully recorded the affect of oxygen and moisture restores the simulator or guess work approach.

Previous authorities on thermal affects on transformers contend two relevant and important items.

1. The present standard transformer rating based on temperature rise of windings deduced from increase in resistance is unsatisfactory since hottest spot temperature can vary over a 10°C range depending on individual design (Fundamental basis of *trstr* thermal rating).
2. Numerical calculation of life based on commonly used laws has little significance or realism. He contends ageing of paper is measured by loss of mechanical strength, the electrical strength being little affected, even by extreme ageing to the point of little remaining tensile strength, and has withstood short circuit tests followed by standard insulation tests. The Johannesburg Electricity Department tends to agree with this concept and has a large number of well maintained distribution transformers dating back to the 1930's. The accent being on 'well maintained' illustrating the condition-based concept applied to an extent during the time based approach.

On the other side of the coin is a very poor record of performance from higher voltage CT's. Ranging from a catastrophic fire at an 88 kV bulk input station where an Eskom through the roof CT bush exploded, to an epidemic of 11 kV switchboard C.T. failures, mainly epoxy encased. One instance was found where oil had migrated and a massive partial discharge had penetrated the case. The author is quite correct in drawing attention to weaknesses with Instrument Transformers.

Partial discharge tests are now regarded as essential before new CT's are accepted from manufacturers and their record in recent times has not been a happy one. Differences of opinion as to what values are acceptable have been the subject of discussion but following failures of C.T.'s approved by manufacturers we are adhering to high standards on partial discharge tests. These tests require highly skilled people but it is considered worthwhile and is part of our conditions — based on ongoing maintenance of switchgear and also spare components.

Deterioration has been found in C.T.'s stored. For e.g. a C.T. stored for a very lengthy period passed the manufacturing tests before energising, was due for gas-in-oil tests after 3 months, but failed violently before this. Several others of this family showed the same tendency on condition monitoring over a short period and were scrapped.

Is this a case for monitoring in the initial period, or continuously monitoring?

275 kV S.O.V. circuit breakers are carefully monitored and have given excellent service. Older 88 kV air blast breakers have shown the need for attention after years of time scheduled maintenance and are having to be rebuilt using local sources as the original manufacturer is no longer in business.

In applying the various test methods for manual monitoring, experience indicates that proper account of variables must be taken, the statistical record of these variables then studied, and the frequency of testing reviewed and adjusted, together with acceptance or rejection levels. Action can then be more confidently taken.

Such an approach has revealed developing faults in three 257 kV transformer tap changers and three 88 kV tap changers over the past two years.

The advise of the international committees has been to develop non-destructive tests for corona, partial discharge, moisture and decomposition products both for monitoring on site and in the workshop in conjunction with reduced voltage levels over longer test period. This method has mainly been applied at higher voltages.

Periodic monitoring will identify most, but not all potential failures, and it is interesting to learn of the approach of large overseas utilities to continuous life monitoring. The fact that microprocessor instrumentation is already accepted and in service for control and protection systems leads to the hope that



this can be extended to monitor properties of individual equipment.

Even very large utilities must be hard put to justify such a scale of monitoring. It is very doubtful that a large municipality could justify the expense based on its record of failures. Possibly for large and expensive 257 kV equipment it could be considered reasonable but even then on a rotational basis.

The gas monitoring equipment is recommended for application in places where there is an oil movement, whereas in C.T.'s and power transformers oil is effectively still. At the moment Johannesburg is awaiting its turn, behind Eskom, to try out the Hydrogen gas monitor. We also believe this method of oil monitoring holds great promise.

The author comments on the various factors affecting ageing of insulation. One of the emerging worries is the affect of the high ultra violet radiation in our atmosphere. What is his experience of surface deterioration on modern insulation and the reduced ability to withstand surface tracking?

We agree that tan delta readings and the monitoring of these results is very important. A current study being carried out to provide a data base where no test records exist is the computer simulation of readings which might have been expected to have occurred in the past life of bushings. Future tan delta tests will be compared to the phantom history. The programme makes use of past histories of those units which have been tested over 20 years or so and their results recorded. This illustrates one of the problems of introducing condition monitoring where previous records are non-existent.

The next project is to be the investigation of the effect of system harmonics, previously negligible, but now appearing in industrial areas, and the effects of these harmonics on insulation deterioration.

Once again we must express our appreciation to Mr Cardwell for his thought provoking paper which will assist us to develop our test strategies in accordance with modern thinking.

#### MR J E TOMS: SABS

I would like to mention another powerful tool for insulation condition monitoring which is applicable to closed circuit gas cooled equipment. These are the thermo-chemical methods, which are still being developed, and which so far, seem to have been applied exclusively to large hydrogen cooled turbo alternators, although there is no reason why the same techniques could not be applied to air, nitrogen, or carbon dioxide cooled equipment.

When organic insulating materials are heated by conductors, magnetic material, or partial discharge, sub-micron particles, which may be droplets in the liquid phase, are released into the cooling gas streams which can be sampled and analysed. Fig. 1 shows a typical layout of a condition monitoring equipment.

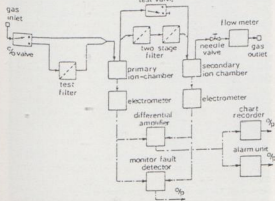


FIG. 1: Schematic of condition monitor.



Mr Jim Toms, SABS

There are two methods of identifying emitted material. A sub-micron filter, placed in the sampled gas streams, traps particles greater than about 16 nano metres in size. These particles are irradiated by a ultra violet source and emit light whose wavelength depends on their composition.

Fig. 2 shows a schematic layout of the filter, UV source and analysing device.

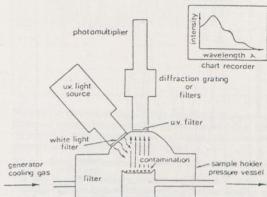


FIG. 2: Typical layout of emission spectra measuring equipment.

Eighteen insulating materials have so far been identified unambiguously by this method which can be used on-line.

The second method, applicable when the emitted material is in the gaseous phase, involves sampling the gas stream and analysing it by gas chromatography in a laboratory.

Both methods described so far, indicate damage to organic insulation, but give no indication of its location, except by inference and knowledge of the location of each insulating material.

To aid the location of hot spots, the micro-capsule system has evolved. These capsules, made of gelatine, and less than 1 mm in diameter, contain specific liquid contents and are designed to burst at a specified temperature between 80 and 200 °C. Table 1 shows measured results from two types of micro-capsules, designed to burst at 100 and 140 °C respectively.

TABLE 1  
BURSTING TEMPERATURES FOR TWO TYPES OF  
MICRO CAPSULES

Test No.	dT/dt, °C/min	Thermally aged at 90°C in air. N.P. for 100 hrs or 240 hrs	Initial bursting temperature with spread in results °C
X <sub>1a</sub>	10	No	120-150
X <sub>2a</sub>	15	No	120-155
X <sub>3a</sub>	25	No	130-160
X <sub>4a</sub>	40	No	130-160
X <sub>1b</sub>	10	Yes	130-145
X <sub>2b</sub>	15	Yes	130-145
X <sub>3b</sub>	25	Yes	140-150
X <sub>4b</sub>	40	Yes	140-150
Y <sub>1a</sub>	10	No	160-200
Y <sub>2a</sub>	15	No	160-205
Y <sub>3a</sub>	25	No	165-200
Y <sub>4a</sub>	40	No	165-205
Y <sub>1b</sub>	10	Yes	170-180
Y <sub>2b</sub>	15	Yes	175-185
Y <sub>3b</sub>	25	Yes	170-180
Y <sub>4b</sub>	40	Yes	175-180

Each quoted result is the average of 20 results. The contents of the micro-capsules, liberated by bursting are trapped by the filter previously described, and identified by their emission spectra.

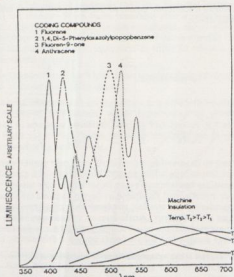


FIG. 3: Shows the emission spectra of 4 typical coding compounds.

It is thus possible to locate a hot spot and its approximate temperature. The methods I have described are expensive and not foolproof. False alarms are caused by contamination and oil mist. They can only be justified when the costs of equipment failure are very high. Commenting on Mr Cardwell's conclusions, it is my opinion that the cost of developing local materials technology is uneconomic in view of the market size. Two examples come to mind, the local production of transformer steels and paper for h.v. cables. I believe that locally available technology could meet both these needs, but the capital cost of production plant would not be justified for a purely local market. At the Bureau, we have similar problems in providing very expensive testing equipment whose cost cannot be recovered from rechargeable work.

#### MR DRIES WOLMARANS: AFFILIATE

Mr President, may I commend the author on the quality and depth of his paper.

In section 3.2, "Electrical Tests", the author states in the second paragraph: The dielectric constant or permittivity of the insulating material is a basic property which should not change significantly during the life of the equipment. The relative permittivity of paper and insulating oil falls in the range 2.2 to 2.5 and this will increase significantly in the presence of a small quantity of water with a relative permittivity of 80. Although dissipation factor is normally used to detect the presence of water, change in capacitance can be a more sensitive test to determine the cut-off time in a cycle of vacuum drying.

Section 4.1 relates to condition monitoring of insulation of rotating machines. I quote from the second paragraph: "Unfortunately it has not been possible to show a correlation between the decline of the machine merit number and the ultimate failure of the particular machine." We believe that a correlation does exist between the rate of decline of merit number and time to failure. The decline of merit number with time has been demonstrated in many cases where records exist on multiple measurements on the same machine over periods of 10 to 20 years. Before a mathematical relationship or correlation can be quantified, many additional actual machine insulation failures are required. The research work was started in 1969 and is being continued.

In the same paragraph, the author refers to correlation between peak partial discharge magnitude and insulation deterioration. The present method of partial discharge magnitude does not discriminate between so called *slot discharges* and *overhang discharges*. The slot discharges occur inside the insulation body and all breakdown products are mainly trapped, in contrast, discharges in the overhang portion of the machine winding, occur mainly as surface discharges. The surface discharges in the overhang occur in a well ventilated area and the cumulative effect can be ignored unless the winding overhang becomes polluted.

Mr President, I would like to emphasize that the performance of capacitance and dissipation factor measurements and partial discharge magnitude detection on high voltage machine winding insulation is a *non-destructive* test. The tests are done at voltages up to root three times phase to ground voltage only, that is approx. 73 % above rated voltage. The tests are intended to monitor the cumulative degradation of the bulk insulation of HV machines as part of planned preventive maintenance programs.

In section 4.3, transformers and reactors, the author refers to mechanical changes in the active part of transformers — see fifth paragraph — and refers to experiments using low voltage impulse and frequency analysis techniques to detect conductor movement. May I add that I.E.C. recommends the measurement of the mutual inductance between the high and low voltage windings before and after a short circuit test.

In section 4.4, Instrument Transformers and Bushings, the author states in paragraph 3: Measurements have proven difficult in outdoor switchyards due to the high levels of electrical noise and other interference. Mr President, the two articles by Weber, Seeberger and Stolpe — Reference 28, and Zaengle and Klaus — Reference 32, cover the same research work, performed by Prof. Zaengle and his assistant Hans-Jurg Weber. They have demonstrated the relative ease to measure partial discharge activity in electromagnetic voltage transformers (and combined electromagnetic voltage and current transformers), at voltages up to 400 kV, in a live switchyard without removing the VT's from their mountings. Detection of partial discharge levels to better than 10 pico coulomb has been achieved.

Also in section 4.4, the author in the last paragraph, refers to "... specially trained staff should be allowed to take bushing oil samples". He does not mention the technique of measuring the dissipation factor of condenser type bushings whilst mounted in the transformer. This method, mentioned by Mr A C Britten, should be used to monitor the change in dissipation factor

with time. Should an increase in dissipation factor be detected, an oil sample would be justified before removing and replacing such a bushing.

#### MR DAVID LIGHTLE: AFFILIATE

Mr President, first of all may I bring you my personal congratulations together with those of my wife and your numerous friends on Tyneside in UK on your accession to the high office of President of the AMEU.

Now I should like to record my appreciation of Mr Cardwell's comprehensive survey of condition monitoring of electrical plant.

My remarks today are limited to the monitoring of high voltage substations in general and switchgear in particular.

At the higher voltages typically 100 kV and above, Gas Insulated Switchgear (GIS) is growing in application and is no stranger to this part of the world.

Since the active components are enclosed in pressurised gas-filled enclosures, 'on line' condition monitoring can

- avoid unscheduled outages
- lead to better planning of remedial measures to coincide with scheduled maintenance of other plant, and in the final instance
- avoid opening up switchgear to find out why it is not working properly i.e. replace scheduled maintenance.

In CIGRE, Working Group 3 of SC23 is charged with the study of Gas Insulated Substations and for some years, has been keeping the subject of continuous monitoring under continuous review — another form of continuous monitoring if you like.

We have published papers which have been discussed at recent CIGRE Paris Conferences and our latest review passed on the Paris discussions in 1986 and 1988, compiled on behalf of the Working Group by Jacques Vigreux will shortly be published in CIGRE's own house magazine ELECTRA.

Turning to my own Company's activities, we believe that undoubtedly the advent of computer-integrated control protection and instrumentation systems with distributed microprocessor architecture into GIS and Open Terminal Transmission Substations will provide economic data processing facilities for condition monitoring sensors.

While economic considerations suggest that such condition monitoring systems are likely to be first installed in Transmission Substations, the move we are seeing towards greater automation in the protection and control of Distribution Systems, certainly in the UK, indicates that the spread to the lower voltage equipments will not lag too far behind.

As Mr Cardwell so correctly suggests, the primary electrical in-

stallation system lies at the heart of electrical plant and in particular in switchboards.

Monitoring the condition of the electrical insulating systems is an obvious goal to achieve and it is to this topic I should like to make my concluding remarks.

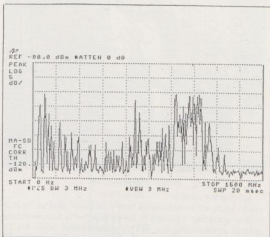
At distribution voltages the mixed insulation systems of air, liquids, solids and gasses renders the problem of monitoring difficult both of detecting and interpreting the appropriate signals.

We are continually researching new materials which before being incorporated into better switchgear are given exhaustive tests for compatibility and in particular ageing during service life.

The first viewfoil shows the range of characteristics we examine and the testing procedures help us in the selection of improved materials for the electrical insulation of our switchgear.

The insulation systems of GIS are much easier to monitor, being based on more homogeneous insulators and quasi-uniform field configurations.

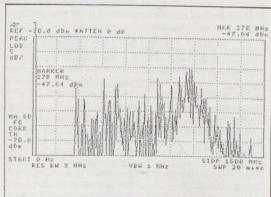
We have developed a UHF method of monitoring partial discharges which is extremely sensitive and enables us to detect, monitor and locate minute partial discharges in the GIS insulating system long before they develop into dangerous conditions.



We base our method on the fact that a partial discharge emits packets of energy which propagates throughout the GIS in both the transverse electromagnetic mode and higher order transverse electrical and transverse magnetic modes.

It is in utilizing these latter emissions that our method is based.

The next viewfoil shows the frequency spectrum of a partial discharge emission from which you will see that the whole range of frequencies from DC to 1500 MHz are represented.



Mr Dave Lightle, Reyrolle UK

The higher order mode TE & TM emissions cannot propagate at frequencies below the cut-off frequency a valve based on the circumference of the GIS enclosure. Nor do they need the presence of the control conductor as do TEM emissions.

The viewfoil for purely illustrative purposes, shows a similar discharge in a rig with the control conductor removed.

Note the absence of frequencies below the cut-off valve of 278 MHz.

In both these cases there are peak emissions in the 1 000 MHz band and it is this characteristic of partial discharge in GIS that we utilize because it provides an unmistakable signature well above the frequencies of atmospheric corona, electromagnetic interference and commercial TV and radio broadcasts.

My last slide shows the schematic arrangement of a continuous monitoring system now installed in prototype form in two 400 kV substations in England and Scotland.

Needless to say the method is invaluable in the process of commissioning during dielectric tests at site and two major 400 kV

**Thermal**  
Heat Distortion  
Expansion  
Conductivity  
Ageing  
Flammability  
Toxic Gases

**Physical**  
Density  
Moisture Absorption  
Weathering  
Fungi Resistance

#### MR G R CARDWELL: AFFILIATE

The authors have described in some detail two types of digital protection relays for use on transformer and feeder equipment. The advances in relay system designs in the past few years have been quite dramatic when one considers what can be accomplished with digital technology incorporated into microprocessor based architecture.

We have heard what can be achieved when the man-machine communications interface is developed to the extent where the relays can be made to "talk" to the operator or distribution engineer in real-time mode as well as provide a precise record of events occurring at the time of a fault or system disturbance.

The paper includes a diagram showing a possible arrangement with data acquisition units for integrated protection relays and measurement and control circuits grouped together on an individual substation bay basis. Unfortunately no details have been given regarding the interfaces between measurement and control circuits and whether there is any interactions with the protection relays other than the interconnections with the substation computer.

The need for a specific hierarchical structure for control and protection tasks including the necessity for a common data format and standardised engineering dialogue was identified as an important subject for further investigations at the 1988 CIGRE Paris Session. Working Group 34-01 of Study Committee No. 34 on Protection is currently reviewing this topic and Working Group 34-03 is investigating the classification of interfaces between protection and control functions to establish protocols for communications with other functions. The whole question of Integrated Substation Control is thus receiving much attention on the international scene and local users should be careful before selecting any one particular system to ensure that it is compatible with existing equipment in the substation.

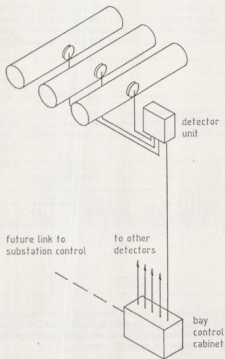
The subject of "Expert Systems" was also a special topic for discussion at the 1988 CIGRE Paris Session and it was suggested that the protection engineer could apply this new technology in areas such as:

- documentation of relay setting calculations
- post-fault analysis and setting revision
- diagnostics of faulty equipment and
- restoration of power systems after a large area disturbance.

Our overseas partners ASEA Brown Boveri in Switzerland have applied this new technology to developing an Integrated Substation Control System based on a general concept of levels of Remote Control from Regional Centre to Substation to Bay and thero individual Equipment. Analogue and digital inputs from the separate units are converted into digital outputs to the Remote Terminal Unit. The signals are multiplexed and transmitted via a Protocol Converter to the Control Centre.

The overall Substation Control System covers all substation functions for supervisory, control, measurement and protection in a co-ordinated concept. The System includes for microprocessor based digital equipment or dedicated conventional devices. The hierarchical structure of the Control System makes use of a common communication busbar between Bay and Station levels so data can be managed between any of the individual Bay equipments and the Station Remote Terminal Unit.

This co-ordinated protection and control system has been designed to cater for different voltage levels at one substation and ABB have incorporated all these features into its new Pyramid concept. The whole concept has been developed to meet the increasing challenges for the supply of electrical energy and it offers improved availability, reliability and cost efficiency of power distribution system operation and service.



substations have been successfully commissioned in Saudi Arabia without embarrassing incidents.

Our method is attracting international attention in CIGRE from major users and competitors and we are hopeful that it may form the basis of an industry standard in the not too distant future.

**TABLE 1 — INSULATION MATERIALS CHARACTERISTICS OF INTEREST**

#### Characteristics of Interest

<b>Electrical</b>	<b>Mechanical</b>
Electric Strength	Tensile
Surface Flashover	Flexural
Surface Resistivity	Impact
Volume Resistivity	Hardness
Permittivity	
Loss Angle (Tan $\sigma$ )	<b>Chemical</b>
Tracking Resistance	Compatibility
Dry Arc Resistance	Resistance
Voltage Endurance	Environmental
	Stability

## SAMEVATTING

Verskaffers van elektriese krag gee al hoe meer aandag aan die werkverrigting van hoë spanning kragtoerusting. Die daling in energie-groeioptrone, gekoppel aan stygende koste verbonde aan vervanging van toerusting, het daartoe gelei dat verskaffers en verbruikers van krag nou aandag gee aan verlengde lewensduur van huidige toerusting asook opknapping van ouer toerusting.

Ongelukkig het tegnologiese ontwikkelinge in gesofistikeerde kragomskakelingstoerusting en ongewenste harmoniese beoelende van die verskaffingsnetwerk, hoër bykomende laste op die isoleringstelsels van hoëspanningsapparaat geplaas. Dit

is dus nuttig om te weet van die toestand van die isoleringstelsels voor besluite geneem word aangaande beplande onderhoud en vervanging van toerusting.

Hierdie referaat, gee 'n oorsig van die spannings in isoleringstelsels onder "in-diens" -omstandighede, algemene integriteits-toets en verwikkelinge in verband met die monitering van toerusting. Opmetingstelsels gebaseer op opgeloste gas-analise, gedeeltelike ontleding opsporing, diëlektrikumkragfaktor asook druk en temperatuur apparaat word bespreek insluitend sommige huidige beskikbare moniteringtoerusting.

## PRESENT AND FUTURE TRENDS IN THE CONDITION MONITORING OF HIGH VOLTAGE POWER EQUIPMENT AS SEEN BY ESKOM

By

M.B. Dewe, D.W. Beatt  
and A.C. Britten

Engineering Investigations,  
Engineering Group, ESKOM

### SYNOPSIS

After a brief overview of present maintenance procedures as carried out by Eskom a more detailed examination of the primary diagnostic tool used, namely Dissolved Gas Analysis, is presented. A brief description of the present in house development of a transformer life reduction monitor based on IEC-354 is given. This is followed by a brief discussion on the present investigations into transformer condition monitoring which include comments on the most likely direction to be taken by Eskom in these investigations. A description is then given on a present survey of abnormal voltages being experienced on the system which is aimed at providing a sound database of this information to assist in determining the typical electrical stresses that insulation is being subjected to. Finally a brief comment is made on other relevant facilities and test procedures, including those applicable to motors, generators and current transformers.

### 1. Introduction

The review paper has been written as a partial response by Eskom to the paper by G.R. Cardwell entitled "Developments in Condition Monitoring of High Voltage Power Equipment" [18].

The paper describes methods presently being used by Eskom to assess the condition or integrity of high voltage equipment comprising primarily transformers, reactors, bushings, current transformers and circuit breakers. Also described is some of the research now being done by Eskom (or supported by Eskom) to enhance existing diagnostic methods and to develop new techniques. In this respect the paper gives some idea of what directions Eskom may be following.

The above work, together with reviews of existing condition based maintenance procedures, has been stimulated by the recent high transformer failure rates experienced by Eskom. The paper thus emphasises condition monitoring in transformers but reference is also made to other equipment such as generators and motors.

### 2. Present Maintenance Procedures

#### 2.1 Preventive Maintenance

Preventive Maintenance of Distribution Plant in Eskom is generally divided into three main elements [16], as follows:

##### 2.1.1 Visual Inspections

The major portion of Eskom's maintenance programme con-



Mr A C Britten, Eskom

sists of various forms of Visual Inspection of the plant by the operators and artisans involved in the daily operating routine of the Main Transmission (MTS) and Distribution System. These inspections are carried out on a scheduled basis while the plant is in its normal operating state and at appropriate safe distances. Defects, abnormalities and the general condition of the plant are noted together with information on parameters such as oil levels, temperatures, pressures, loadings, etc. The staff involved in these activities have sufficient knowledge and experience to be able to evaluate the operational performance, defects and abnormalities in order to take the all important decisions on when to request specialist advice and direction on how to deal with the problem in hand.

##### 2.1.2 Scheduled Examinations

High Voltage plant is scheduled for detailed examination at set intervals and is time dependant on the particular item and the scope of the specific examination. Plant is taken out of service for such maintenance. For example, circuit breakers and links have routine examinations every two years while, every five years, transformer tap changers are subjected to a detailed examination by specialists. Consideration is being given to more frequent inspections.

Shortage of skilled manpower and associated resources is motivating some Regions to closely examine "time based" maintenance. Frequently plant, which is in very good order and has only been subject to minimal operational stress and/or loading, is pulled out of service to be dismantled just because it is due in time. Since "maintenance" of this type invariably involves some risk of finger problems and the introduction of inferior materials and parts, it is equally probable that the reliability will be reduced rather than improved. Consequently at-

tion is being paid to the possibility of relating the service frequency to parameters which reflect operational usage and life of the particular plant. For example, in the case of breakers, this parameter could be the total fault amperage interrupted by the breaker while, for transformers, it could be based simply on an integrated load with time value. Alternatively, for transformers, a more complex function involving load and oil temperature(s) such as described below may provide a truer indication of the need for servicing.

### 2.1.3 Condition Maintenance

Following a spate of large transformer and CT failures in Eskom a workgroup was established to analyse each failure in depth to determine causes of failure and possible preventive action.

As a result of this exercise it was decided to implement regular oil analyses, on an annual basis, on all transformers of 2MVA rating and above. An Eskom Standard No. NWS-1076 entitled "The Use, Sampling and Testing of Mineral Insulating Oil for High Voltage Plant" has been raised to institute and control this new maintenance requirement [17]. Figure 3.1, which was extracted from this standard, summarises this activity and a more detailed discussion is provided below.

### 2.1.4 Dielectric Testing

High voltage testing — comprising essentially "tan δ" and insulation resistance measurements — is presently done on bushings, current transformers and rotating plant during overhauls and repair work. This work tends to be irregularly done at

FIGURE 3.1

## SUMMARISED REFERENCE TABLES FOR THE USE, SAMPLING AND TESTING OF MINERAL INSULATING OIL

TRANSFORMERS, REACTORS, CT'S, VT'S AND BUSHINGS					
EQUIPMENT	OIL TYPE		SKILL	Minimum Sampling Frequency (2 Samples Required)	Test Required
	Grade				
Transformers					DS WC GA A
Category A: 88 kV and above 20 MVA and above MTS Unit auxiliaries	New Original * Regenerated	* "Original oil" may contain required inhibitors — check before filling/replacing	Trained	Before energising	DS WC GA A
				After 48 hours on load	DS WC GA
Category B: 3,3kV to < 88kV 2,0 to < 20MVA	New Original * Regenerated Grade one			After 1st, 3rd and 6th month in service	DS WC GA
				Annually thereafter	DS WC GA A
Reactors	New Original * Regenerated			Within 24 hours after a fault	DS WC GA
Bushings CT's VT's	Type of oil required is to be ascertained before filling (eg inhibited)		Specialist	Oil samples only be taken by CMS or persons authorised by them. (Number of samples to be determined by specialist.)	

- NOTE: (i) Transformers below 2,0 MVA need only be oil sampled if specially so required.  
(ii) It is recommended that at least the dielectric strength of oil be tested prior to use.

TRANSFORMER OIL TEST LIMITS			
OIL TESTS	TOPPING UP	IN SERVICE	
		Category A:	Category B:
		DS = Dielectric strength WC 3 Water Content GA = Gas Analysis A = Acidity	min 70kV/2,5 mm gap max 10mg/kg (ppm) Refer to oil specialist/Chemist Category A: max 0,03 mg KOH/g Category B: max 0,1 mg KOH/g

SWITCHGEAR (OCB'S, OIL SWITCHES, ETC)				
OIL TYPE	SKILL	SAMPLE FREQUENCY (1 SAMPLE REQUIRED)	OIL TESTS	FILLING AND TOPPING UP OIL TEST LIMITS
Grade one or Better	Trained	Condition/monitoring/ after fault/ planned maintenance	DS = Dielectric strength WC = Water content A = Acidity	min 50kV/2,5 mm gap max 30mg/kg (ppm) max 0,2 mg KOH/g

present. As regards bushings and current transformers, a more regular programme of such tests is being considered and it is intended that comparative "tan  $\delta$ " levels will provide an important way of assessing the condition of bushings, for example.

## 2.2 Breakdown Maintenance

As the name implies this maintenance activity is concerned with the problems associated with restoring supply once an unexpected breakdown has occurred. Typically such breakdowns take place under the most adverse weather and loading conditions making repairs difficult and hazardous. By their very nature these breakdowns can also cause considerable damage to adjacent plant which would not necessarily normally require maintenance.

Planning for such plant failures is extremely difficult and generally revolves around the setting up of suitable spares holdings at strategically located sites.

## 3. Oil Analysis Procedures

### 3.1 General

Oil analysis is now the primary means by which the condition of Eskom's power transformers and current transformers is monitored. To this end Eskom recently released the new standard NWS-1076(Rev.0) [17] covering "The Use, Sampling and Testing of Mineral Insulating Oil for High Voltage Plant". As mentioned above, Figure 3.1, extracted from this Standard, provides a useful summary of the application of the Standard. The key factor in these tests is the building up and maintaining of a database of test results on each individual transformer. This would include the more frequent tests carried out during the commissioning and first 6 months of operational life of the plant. This enables ready assessment of changes in the insulation state of the transformer and the detection of incipient fault conditions. It will be noted in Figure 3.1 that testing reverts to an annual basis after the first 6 months life of the transformer. Furthermore, as a matter of procedure, oil samples are also taken within 24 hours of a fault. In fact it is also envisaged that the frequency of sampling may need to be increased to typically once per week in the case of a troublesome transformer. Investigations are also in hand on the possibility of installing "On-line Dissolved Gas Analysis (DGA)" equipment. The cost of such equipment is, at present, prohibitive and could only be justified on the very high MVA transformers or as a semi-permanent installation on a problem transformer.

Clearly the introduction of these procedures is going to place a major workload on the Eskom laboratory facilities. In view of this consideration is also being given to the possible introduction of portable field DGA Test Sets which, while they do not have the precision of the laboratory based equipment, could provide a level of field screening of oil samples. These field sets are generally capable of detecting the presence of the primary gases produced (namely  $H_2$  and  $CH_4$ ) and effectively identify the need for more detailed analysis. This would reduce the central laboratory load and could potentially enable more frequent scheduled oil sample tests to be carried out.

The following sections summarise the key features and capabilities of the procedures and tests detailed in NWS-1076 Standard [17].

### 3.2 Operational Procedures

Following the definition of the scope and terminology used, the primary actions required by the Standard are fully detailed. These cover:

- Oil Filling and Topping up
- Oil Sampling
- Oil Tests
  - Laboratory Tests
  - On Site Tests (prior to topping up)

Documentation in terms of test reports, their distribution and retention are then covered. Relevant specifications and standards are listed.

### 3.3 Management

A clear designation of responsibilities for the above actions is

defined. This covers both site and laboratory activities. Overall responsibility for the status of the Standard is vested in the Distribution Engineering Manager.

## 3.4 Dielectric Strength Test

The Dielectric Strength Test is performed according to the IEC-156 Standard. The dielectric strength of the oil, which is effectively a measure of the oil's ability to withstand electrical stress without failure, is exceptionally sensitive to the slightest contamination such as water, sediment and conducting particles. Combinations of these tend to reduce the dielectric strength to an even greater degree. While clean dry oil has an inherently high dielectric strength, it does not necessarily indicate a total absence of contaminants, but simply that the level of contaminants between the electrodes is insufficient to affect the average breakdown voltage of the oil. This test is carried out on the oil as received, without drying or degassing. Strong emphasis is placed on the importance of careful sampling with special reference to avoiding the possible absorption of humidity. Skilled personnel are called for in this exercise.

The design, preparation and care of the test cell and its electrodes are carefully specified. The preparation of the sample so as to ensure a homogeneous distribution of the oil impurities without the presence of air bubbles is described and should be carried out in a dry, dust free environment at an ambient temperature in the region of 20°C (15 - 20°C). The oil should be at the same temperature.

The basic test consists of applying to the electrodes an increasing AC voltage at mains frequency (40 - 62 Hz), starting from zero volts and increasing at a steady rate of 2 kV/s until the value producing breakdown is reached. Breakdown is defined as the voltage reached when the first spark-over occurs whether transient or established. The test is repeated six times on the same sample. The timing of the sample preparation and the subsequent tests is critical. Maximum and minimum times are given for each test within which the tests must be completed on a bubble-free sample — i.e. any bubbles formed must have settled out.

The final result is the arithmetic mean of all six tests and this should be better than the figure given in Figure 3.1.

## 3.5 Oil Testing and Dissolved Gas Analysis

### 3.5.1 Origins of Gases in Transformer Oil

Dissolved Gas Analysis DGA is a valuable technique for detecting and identifying faults occurring within transformers and reactors. Fault gases, which will generally re-dissolve in the oil, arise from the decomposition (breakdown) of the insulating oil and other insulating materials (paper, barrier board, resin, etc.). The primary gases so produced in order of priority are:

Hydrogen	$H_2$
Methane	$CH_4$
Ethane	$C_2H_6$
Ethylene	$C_2H_4$
Acetylene	$C_2H_2$
Carbon Monoxide	CO
Carbon Dioxide	$CO_2$

Other higher hydrocarbons are produced but are of little consequence in interpreting gas analysis data.

Fault gases can be caused by three basic phenomena:

1. **Partial Discharge** which results from low level energy and usually occurs in gas-filled voids surrounded by oil impregnated material. The main cause of decomposition is the ionic bombardment of the oil molecules resulting in the production of primarily hydrogen and secondly methane.
2. **Thermal Faults** in which a small amount of degradation occurs at normal operating temperatures and as the fault temperature rises this degradation increases with the formation of the gases changing progressively from Methane to Ethane to Ethylene (e.g. above 300°C Ethylene is mainly produced).
3. **Arcing** which results from high energy discharge and can cause temperatures of over 3 000°C to develop. The major gas generated is Acetylene and if cellulose material is involved

Carbon Monoxide and Carbon Dioxide are produced. In the latter case the CO<sub>2</sub>/CO ratio is usually examined and should lie outside the range of 3 to 11 a fault is indicated provided the other gas analysis results also indicate excessive oil degradation.

The actual gas concentrations present in the oil as a result of the above phenomena also depend on a number of other factors including:

1. **Dilution Factor** — the volume of oil involved.
2. **Age** of the transformer (new or old).
3. **History** of the transformer (repaired, degassed, etc.)
4. **Type** of transformer (Generator or Transmission / Sealed or Free-breathing / Construction of Tap-changer)

### 3.5.2 Gas Chromatography

Gas Chromatography involves the separation, identification and quantification of the gases found dissolved in the oil. It requires the use of sophisticated laboratory equipment and highly specialist technical skills. The gases examined are predominantly those listed above. Analysis of the types and amounts present can be interpreted in terms of the severity and type of fault present in the transformer. A specialist can identify the presence of an incipient fault (early warning).

### 3.5.3 Interpretation of Gas Analysis Test Results

Examination of the numerous international guidelines on interpreting DGA data show that this is more of an art than a science. Some of the guidelines are:

1. Dornenburg Ratio Method
2. Rogers Ratio Method
3. BS5800/IEC-599 Ratio Method
4. Key Gas Method — Doble Engineering
5. Amount of Key Gases — CSUS
6. Total Combustible Gases — Westinghouse
7. Combustible Concentration Limits
  - ANSL/IEEE/CEGB (USA/UK)
  - Hydro Quebec (Canada)
  - BBC (Switzerland)
  - SECR (Japan)
  - EDF (France)
  - Oy Stromberg (Finland)

The Combustible Concentration Limits differ from country to country and transformer to transformer which make it virtually impossible to set the limits because of the many variations involved.

Eskom's method of interpretation, which is strongly dependant on specialist assessment, is broadly based on:

1. Key Gases present
2. BS5800/IEC-599 (provided the Total Combustible Gases present exceed 300ppm)
3. Transformer Age
4. Trend Information (Production rate of gases)
5. History of Transformer

### 3.5.4 Acidity or Neutralization Value

Acidity tests are based on IEC-296 test methods. Acids present in the oil can originate from the oil decomposition/oxidation products or from external sources such as atmospheric contamination. In the presence of water it can induce rusting inside the transformer. It provides an indication of the rate of deterioration of the oil and usually results in the inevitable by-product of SLUDGE which is often neglected with subsequent effect on factors such as the transformer cooling efficiency.

### 3.5.5 Water Content Tests

Water Tests are based on ASTM-1533 (Karl Fischer Titration). Meaningful Water Content Tests are only as good as the Oil Sample being tested. Water, even in minute quantities, is harmful in power equipment as it is attracted to the places of greatest electrical stress where it can do the most damage. It accelerates the deterioration of both the insulating material (paper etc.) and the insulating oil producing more water in the process. This can be a vicious circle and once the paper has been degraded it can never (unlike oil) be returned to its original condition.

Water can originate from two sources:

1. **Atmospheric** — either via the silica gel breather or via leaks in the power equipment.
2. **Internal** — paper degradation produces water, and oil degradation produces water — migration of water takes place between wet insulation and the oil and vice versa depending on the oil temperature — this can make it very difficult to "dry" the transformer oil.

### 3.5.6 Interfacial Tension

Interfacial Tension (IFT) is tested according to ASTM-D971 (Ring Method). It is basically a measure of the tension at the interface between two liquids (oil and water) which do not mix and is expressed in dynes/cm. It is sensitive to the presence of oil decay products and soluble polar contaminants from solid insulating materials. Good oil will have an IFT of between 40 to 50 dynes/cm. Oil oxidation products lower the IFT and have an affinity for both water (hydrophilic) and oil. A badly deteriorated oil would typically have an IFT of 18 dynes/cm or less.

## 4. Transformer Insulation Life Reduction Monitor Development

### 4.1 Overview

One of the outcomes of the investigations into the recent spate of transformer failures was the decision to examine the possibility of developing an instrument to measure the rate of life usage, and conversely the available life, of a transformer. An initial feasibility study was carried out [15] earlier this year. The resulting report discusses the design philosophy which is essentially based on insulation life equations which are used to prepare the "Loading Guide for Oil — Immersed Transformers" as given in IEC-354 [1]. The insulation life is primarily a function of the insulation temperature and time as defined by Arrhenius's Law. As the insulation (hot spot) temperature cannot be measured directly because its precise location is never known, it is estimated from information on the top-of-tank oil temperature and the load factor that the transformer is being subjected to. The feasibility report examined the potential error in the estimated life as a function of the measured parameters (temperature and load current) in order to establish the technical requirements for the temperature and current transducers and the measurement process. The results of this analysis demonstrated that the estimated life is very sensitive to inaccuracies in the measured parameters because of the logarithmic nature of Arrhenius's Law. For example, it would appear that to ensure a "life use" estimate accuracy of say better than 20% the hot spot temperature estimate should be within 1.5%. It raises the question of how accurately the estimates of the transformer's insulating life need to be if the information is to be of practical benefit.

### 4.2 Design Requirements

As a result of the initial study the following basic design requirements were established:

**Input Signals:**

1. **Top Oil Temperature**  
Range: 20° C — 100° C  
Accuracy: ± 0.4%

2. **Load**  
Range: 0 — 1.5 Amps  
Accuracy: ± 0.4%

**Output Signals:** **Life Hours Used** (visual display)  
Range: 0 — 350 000 hours  
Accuracy: ± 10%

**Environmental Conditions:** To Eskom Standard NWS-1318 (Rev. 0), "Environmental Requirements and Tests for Electronic Measuring Equipment", August 1984.

**Reliability:** Desired MTBF — 30 years

**Power Supply:** Mains — 220 VAC, 0.5 Amps.

The implications of the above requirements is that additional top of oil temperature transducer(s) with appropriate accuracy



will be required. However, existing current transformers should be adequate.

### 4.3 Prototype Development

Initial examination of the alternatives for implementing the above showed a number of viable different solutions including analog circuitry. In the end it was decided to use a microcontroller with appropriate A/D input conversion circuitry and a digitally driven electromechanical display counter for recording the hours of life used. There are a number of options for the display such as small alphanumeric LCD displays which could readily enable the display of other transformer information such as peak and average temperatures and loads. The choice of a microcontroller based solution does in fact provide a lot of flexibility for future modifications and improvements.

### 4.4 Present Status and Field Trials

A prototype has been developed and is being tested out in the laboratory to ensure that it is functionally behaving as per specification. Environmental tests to NWS-1318 are still to be performed. The next stage would be to install it in a field situation and monitor its performance to ensure compliance with requirements and evaluate its usefulness.

## 5. Transformer Condition Monitoring Techniques Investigation

### 5.1 Introduction

An investigation is presently underway into techniques for measuring the insulation integrity of transformers in addition to the primary method of Dissolved Gas Analysis now in use. Many factors are combining to make this a highly desirable exercise. The cost of replacing old plant, which is or maybe near the end of its life for whatever reason, makes it worthwhile being able to assess whether the plant's life can be extended on the basis of its present condition or by refurbishing at a convenient point in time. Furthermore, with advancements in the knowledge of the performance of old and new insulating materials and the highly cost competitive manufacturer's environment, new plant is being designed and built to very much tighter design tolerances and safety margins. Another factor is the increasing emphasis being placed on raising the loading of existing transformers with particular regard to planned loading beyond nameplate rating. Conversely the levels and frequency of electrical stress that power generating and distributional equipment is being subjected to is continually increasing with the ever increasing use of fast solid-state power switching equipment by consumers. There is also a very definite need to improve the efficiency of maintenance procedures from both the viewpoints of the timely detection of critical transformer insulation deterioration and of the efficient use of skilled maintenance personnel which are in short supply.

Over recent years investigations into diagnostic techniques for determining the condition of transformer insulation have been many and varied. Many of these techniques are considered to be "interesting academic laboratory exercises" by practicing power engineers and maintenance staff. However advances in electronic and computer instrumentation and measurement technology are progressing at a rapid rate making the possibility of applying many of these new techniques a reality. There is real and understandable concern that placing sophisticated electronic equipment on or in transformers will create more problems than it alleviates. Initial experience with the introduction of solid-state power system protection equipment probably gives substance to these fears. However, properly designed, interfaced, tested and installed electronic equipment can be made to withstand the harshest environment with a reliability that could match or exceed that of the equipment being monitored. Ultimately the decision on whether or not to introduce such technology must be an economic one in which the cost of its introduction must outweigh the losses incurred from failures, outages and inefficient maintenance procedures. As time progresses so the relative cost of applying high technology decreases and it is only a matter of time before the introduction of sophisticated condition monitoring becomes economically viable. Meanwhile Eskom is endeavouring to keep abreast of all present research on condition monitoring and diagnostic techniques with

an evaluation programme which will enable it to make the right decisions at the right time.

### 5.2 Literature Survey

A fundamental requirement of any research programme is to ensure that all the available relevant published work has been thoroughly surveyed and evaluated. To date some 250 references covering a number of topics directly relevant to condition monitoring, testing and maintenance procedures have been acquired and are being evaluated and summarised. The search has concentrated on the last ten years but where appropriate has extended before this period. While overlap is inevitable the papers have been roughly classified into the following subject areas:

- general
- standards and codes of practice
- design and modelling considerations
- field measurements, reports and failure mechanisms
- diagnostic techniques and alternatives
- partial discharge testing
- high voltage impulse testing
- other impulse and overpotential testing techniques
- acoustic techniques
- oil analysis
- thermal measurement techniques
- off-line instrumentation and measurement systems
- on-line condition monitoring systems
- transducers and interfacing
- signal digitizing
- waveform analysis

The sources of papers and articles include Inspec, IEEE and IEE Transactions and Journals, CIGRE and EPRI publications.

### 5.3 Diagnostic Techniques and Alternatives

Diagnostic methods that are presently in vogue fall into several clear-cut categories all of which have their own advantages and disadvantages as far as interpreting the transformer's condition is concerned. In general the aim of diagnostic tests is to detect changes in the integrity of the transformer insulation and ideally monitor these changes over a period of weeks or months so that sufficient evidence is available to make further investigations or take remedial action on a planned rather than emergency basis [4].

#### 5.3.1 Oil Analysis

The DGA procedures presently practiced by Eskom have already been described. As a diagnostic tool it would appear to be the most sensitive and the most widely used procedure. The predominant approach to using DGA is site sampling with laboratory analysis by skilled specialists. This inherently limits the frequency (once per year!) of regular testing unless other factors and events suggest more frequent testing is called for. The development and application of both field and permanently installed DGA monitors is happening in practice and reports on this experience are beginning to appear. Full site DGA monitors are prohibitively expensive. Coarse site detection of key gases such as hydrogen as an early warning for more detailed analysis seems the most probable initial direction that permanent on-line DGA Monitors are likely to go and these are only likely to be installed on very large transformers. DGA analysis for bushings and CT's appears highly impractical from the sheer numbers and the small volumes of oil involved.

A limitation of present conventional DGA analysis is that most of the gases can come from degradation of either the oil or the cellulose and as it is the latter that is important as far as the long term health of the transformers is concerned additional test need to be developed to assess the degree of degradation of the cellulose or polymerisation of the paper. Such tests have in fact been developed based on the technique of detecting the presence and mass of furanes present. The technique is in its infancy and under evaluation by several overseas utilities. It is also expensive to apply.

One of the prime disadvantages of DGA is that there are inherent delays between site sampling and the subsequent diagnosis of the transformer state. These delays could be critical.

Other disadvantages re that it gives no precise information on the location of the insulation damage and it requires time to establish positive trends in the results obtained. Having said all this it still remains the most sensitive diagnostic technique and reputedly [4] can detect up to 90% of all potential faults.

### 5.3.2 Partial Discharge Measurement and Location

Partial discharges from a transformer modelling view point manifest themselves as "poles" predominantly in the upper frequency (0.1 – 3 MHz) range. Detection techniques, other than DGA which has already been discussed, basically involve either RIV (Radio Influence Voltage) or acoustic (ultrasonic) methods and much of the research has concentrated on developing evaluation methods to locate the sources of the partial discharges. There are clearly many difficulties in applying partial discharge diagnostic methods in site localities and the general consensus [7] seems to be that this is primarily a manufacturers testing tool which can be used more successfully in their relatively controlled environment. There does appear to be more prevalent application of acoustic measurement methods in site situations and it would seem that this is the more likely candidate to complement DGA techniques in on-line monitoring systems [3] — in effect it would provide a partial discharge measurement capability with shorter response times than the slower but more sensitive DGA approach [7].

### 5.3.3 Detection of Mechanical Changes

It has been suggested [7] that mechanical deterioration is frequently the cause of subsequent electrical failures. Direct measurement of mechanical changes can be achieved by fitting strain gauges to measure clamping pressure on windings although this does not appear to be common practice. A slightly less direct method is that of measuring the acoustic vibration signature of the transformer. Some research has been done in this respect [8], while much more has been done on ultrasonic measurement of partial discharge activity. The ability of the experienced plant operator to feel "something wrong" about a transformer is legend. The recent major advances in digital signal processing and expert systems must make this one of the most fruitful areas of investigations for on-line monitoring. It has the unique potential of being a sensing system that can be applied to both new and old plant with minimal interference to either the electrical or cooling operation of the transformer.

The other well recognised method of detecting mechanical defects is the measurement of changes in the transformer impedance. One approach that has been evolving over the last 40 years is that of LVI or low voltage impulse testing of transformers which basically relies on the comparison of the resulting input and output waveforms from successive tests on the same transformer or from different "identical" transformers. The second approach is known as the FRA or frequency response analysis method which essentially measures the frequency response (or impedance characteristics!) directly by means of sinusoidal test signal which is incremented for successive measurements until the response across the desired frequency spectrum has been obtained — again comparison with previous or good transformers enables the detection of mechanical change.

In terms of the parameters being measured, namely impedance, there is a third method [11] which has been receiving a lot of recent interest although its prime aim was the detection of partial discharges. This approach used high voltage impulses as an excitation source both to stress the insulation and to activate the very high frequency poles resulting from any ensuing partial discharges which effectively changed the impedance characteristics particularly at the high frequency end. In short the impulse transmittance function was convolved from the excitation voltage wave shape and the resultant neutral leg current. This impulse response was then transformed into the frequency domain fingerprint which could again be compared with previous results — one of its prime attributes was that in theory it was effectively independent of the excitation waveshape — furthermore it could in principle be derived from the naturally occurring transients on the network which potentially meant it was a suitable candidate for on-line monitoring. Clearly the impedance information contained in the lower and middle end of the spectrum would contain the same information that the

FRA method provided and would indicate mechanical movement. It would then appear that the high voltage impulse technique of transforming the impulse impedance characteristics into the frequency domain would be equally applicable to the LVI method although this does not seem to have been done in practice (probably because there has not been much research activity in recent years in the LVI area). In theory the impedance characteristics of the transformer are being identified by different excitation signals with appropriate processing. In this vein a third alternative excitation signal is that of white noise which when appropriately crosscorrelated with the resulting output signal will again yield the impulse impedance characteristics that can in turn again be transformed into the frequency domain — in practice pseudo white noise in the form of pseudo random binary signals (PRBS) is often used. Thus there are three approaches to the same end. Two of these, by using either the naturally occurring transients or injecting low level PRBS signals, are also ideal candidates for on-line monitoring investigation.

### 5.3.4 Hot-Spot Detection

The primary aim behind hot spot detection is that of prevention rather than detecting the symptoms or results of insulation breakdown. "Good" knowledge of the winding temperature can not only guarantee insulation longevity by ensuring that critical temperatures are never exceeded but also enables the transformer to be run at maximum load. The key is "good" and as hot spots can never be precisely located there are severe practical problems. The most common technique applied is that of estimating the hotspot temperature from a thermal image and measurements of oil temperatures that are easy to get at such as top of tank oil. At best this is still a coarse approximation.

More recently on experimental bases there have been reports on the development of implanted temperature devices for accurate winding temperature measurement [6,2]. The two main techniques involved firstly the use of fibre optics with crystalline type transducers and secondly the use of vapour pressure devices. Initial results appear promising but are still very much in the development stage and costs very high [7]. Clearly the main aim with thermal measurements must be one of on-line monitoring investigation.

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### 5.4 One-Line Condition Monitoring/Off-Line Measurement Systems

As previously commented the prevalent use of on-line condition monitoring is really only a matter of time. The suitability or otherwise of diagnostic techniques for on-line monitoring has already been discussed above. In the last five years there have been a spate of papers describing both experimental as well as commercial systems. The best known commercial system is the Westinghouse TMS system [3] which provides an in-

egrated series of sensor modules connected to a local data acquisition and display unit which in turn can be linked to the station controller. Sensor inputs include:

- top of oil temperature
- load currents and voltages
- partial discharge detection by acoustic methods
- DGA analysis (hydrogen)
- status information (oil level, oil flow, etc. — 32 channels)

The local unit retains an image of the healthy operation of the transformer and flags when deviations from this state occur.

Most of the remaining papers on the subject describe experimental systems which apply specific diagnostic techniques to on-line condition monitoring. Malewski describes [5] a system which monitors overvoltages, partial discharge measurement (based on his HV impulse technique described above) and an on-line DGA. An experienced operator is still required to interpret the readings. Another system describes the combination of DGA with RF discharge measurements [9] although it is not clear what level of success was achieved. One paper concentrates on partial discharge measurement alone [10] and uses both RIV and acoustic measurement and claims that appropriate filtering can yield acceptable results. An EPRI paper describes the experience [12] of several utilities in the USA in applying diagnostic systems which include vibration signature analysis as well as RF and ultrasonic acoustic partial discharge measurement. Two papers describe Japanese experience [13,14] — one of these concentrates on corona and partial discharge detection — the other uses partial discharge and other status types of information. One paper specifically addresses the current transformer monitoring problem — this relies on power factor measurement and a hydrogen monitor.

Success on all these experimental systems is varied but clearly shows that there is a strong interest in applying such systems. Apart from DGA two of the most promising areas as previously mentioned would appear to be vibration signature analysis and the frequency response (impedance measurement) techniques.

## 6. Dielectric Testing

This is intended as a very brief review of the more important dielectric tests being done by Eskom.

As mentioned in section 2.1.4, dielectric tests on transformer bushings are usually done during repair or tap-changing maintenance operations. This means that "tan  $\delta$ " and leakage current measurements, for example, tend to be done at irregular intervals. Consideration is now being given to implementing a more regular programme which, as regards "tan  $\delta$ " measurements, would make use of modern techniques whereby this parameter is measured in situ with the help of the bushing capacitance tap.

Routine partial discharge tests are generally not done on bushings, but consideration is also being given to this.

Current transformers are also tested irregularly — difficulties in obtaining outages being the main reason for this. Research is presently being done jointly by Eskom and the CSIR to investigate the application of on-site partial discharge measurements and the correlation of the resulting levels with the co-incident generation of hydrogen and acetylene.

Dielectric tests are not done on surge arresters, but in special cases — associated with insulation pollution on metal oxide surge arresters — block currents are measured. The number of such measurements is expected to increase in the future.

"Tan  $\delta$ ", leakage current and partial discharge (in some cases) measurements are done on generator stators after routine overhauls. This has resulted in tests being done every two to three years. A database is presently being compiled to facilitate comparisons on test-by-test basis.

Dielectric tests are performed at roughly two year intervals on the various high voltage motors in power stations. These comprise tests such as "tan  $\delta$ ", winding capacitance, partial discharge and 50Hz voltage withstand measurements. A database

has been established, now making meaningful comparisons possible.

## 7. Survey of Abnormal Voltages on the Interconnected System

### 7.1 Scope and Motivation

Following the investigations into the recent high failure rates of transformers and current transformers in the interconnected system it was decided that long-term measurements of the following types of overvoltage should be carried out at selected sites:

1. "Slow" variations in the power frequency voltage.
2. Temporary overvoltages during faults (amplitude and duration).
3. Transients and voltage surges.

The justification for making such a survey is as follows:

1. The survey will provide a comprehensive database of typical voltage levels experienced on the network.
2. The survey will help identify the substations where high voltage stresses occur and hence the equipment which might be adversely affected.
3. Provide data which will be used to assess possible progressive ageing and degradation of solid and liquid insulation.
4. Where knowledge of ageing is limited, the information may be used to indicate where appropriate research should be done.
5. It would be a necessary complement to the in-depth "spot" measurements already done (e.g. at Pluto, Hydra and Mersey) and future such measurements.

Clearly decisions have to be made on the "depth" of information to be acquired for the three categories of overvoltage identified. Furthermore the ease with which these measurements can be made must be ascertained and the corresponding requirements and costs of the measurement and data acquisition systems must be established. The total costs of this project are not insignificant and as a result it is being tackled in two stages. The first stage, which is currently under way, is to complete a detailed technical feasibility and cost study. This will set the direction of the second stage which is the full-scale implementation of the survey.

### 7.2 Slow Variations in Power Frequency Voltage

This is the easiest and consequently the most economical survey to carry out as it essentially uses the existing National Control instrumentation and data acquisition equipment and has no stringent requirements in terms of bandwidth and resolution. At present National Control measure this voltage via their hardware and the data is relayed through their microwave communication network to the National Control Centre at Simmerpan. The frequency of measurement can be set to any desired value and typically would be once per half hour. It is proposed to ultimately present the data in graphical form against time.

### 7.3 Temporary Overvoltage Monitoring

One solution here is to make use of existing disturbance recorders associated with the busbar and line protection systems which record the 3-phase voltages and currents. Generally these recorders are only triggered if the protection system operates. Obviously there are many overvoltage situations which may not trigger the protection system but which need to be monitored in terms of this survey's requirements. On a few stations there are more recently installed recorders which can be readily set to trigger off present overvoltage or rate-of-change-voltage conditions. The traces of these recorders are small and consequently the data cannot be digitised with adequate resolution. Clearly, once the resolution and bandwidth for these measurements is established, a better and cost effective solution will be identified.

### 7.4 Transients and Voltage Surges

Since transients are the most damaging voltages to the transformer insulation they are probably the most important aspects of the survey. Equally they impose the most severe requirements on the measurement and data acquisition system. In terms of the instrumentation and data acquisition system these measure-

Other disadvantages re that it gives no precise information on the location of the insulation damage and it requires time to establish positive trends in the results obtained. Having said all this it still remains the most sensitive diagnostic technique and reputedly [4] can detect up to 90% of all potential faults.

### 5.3.2 Partial Discharge Measurement and Location

Partial discharges from a transformer modelling view point manifest themselves as "poles" predominantly in the upper frequency (0.1 – 3 MHz) range. Detection techniques, other than DGA which has already been discussed, basically involve either RIV (Radio Influence Voltage) or acoustic (ultrasonic) methods and much of the research has concentrated on developing evaluation methods to locate the sources of the partial discharges. There are clearly many difficulties in applying partial discharge diagnostic methods in site localities and the general consensus [7] seems to be that this is primarily a manufacturers testing tool which can be used more successfully in their relatively controlled environment. There does appear to be more prevalent application of acoustic measurement methods in site situations and it would seem that this is the more likely candidate to complement DGA techniques in on-line monitoring systems [3] — in effect it would provide a partial discharge measurement capability with shorter response times than the slower but more sensitive DGA approach [7].

### 5.3.3 Detection of Mechanical Changes

It has been suggested [7] that mechanical deterioration is frequently the cause of subsequent electrical failures. Direct measurement of mechanical changes can be achieved by fitting strain gauges to measure clamping pressure on windings although this does not appear to be common practice. A slightly less direct method is that of measuring the acoustic vibration signature of the transformer. Some research has been done in this respect [8], while much more has been done on ultrasonic measurement of partial discharge activity. The ability of the experienced plant operator to feel "something wrong" about a transformer is legend. The recent major advances in digital signal processing and expert systems must make this one of the most fruitful areas of investigations for on-line monitoring. It has the unique potential of being a sensing system that can be applied to both new and old plant with minimal interference to either the electrical or cooling operation of the transformer.

The other well recognised method of detecting mechanical defects is the measurement of changes in the transformer impedance. One approach that has been evolving over the last 40 years is that of LVI or low voltage impulse testing of transformers which basically relies on the comparison of the resulting input and output waveforms from successive tests on the same transformer or from different "identical" transformers. The second approach is known as the FRA or frequency response analysis method which essentially measures the frequency response (or impedance characteristics) directly by means of sinusoidal test signal which is incremented for successive measurements until the response across the desired frequency spectrum has been obtained — again comparison with previous or good transformers enables the detection of mechanical change. In terms of the parameters being measured, namely impedance, there is a third method [11] which has been receiving a lot of recent interest although its prime aim was the detection of partial discharges. This approach used high voltage impulses as an excitation source both to stress the insulation and to activate the very high frequency poles resulting from any ensuing partial discharges which effectively changed the impedance characteristics particularly at the high frequency end. In short the impulse transmittance function was convolved from the excitation voltage wave shape and the resultant neutral leg current. This impulse response was then transformed into the frequency domain fingerprint which could again be compared with previous results — one of its prime attributes was that in theory it was effectively independent of the excitation waveshape — furthermore it could in principle be derived from the naturally occurring transients on the network which potentially meant it was a suitable candidate for on-line monitoring. Clearly the impedance information contained in the lower and middle end of the spectrum would contain the same information that the

FRA method provided and would indicate mechanical movement. It would then appear that the high voltage impulse technique of transforming the impulse impedance characteristics into the frequency domain would be equally applicable to the LVI method although this does not seem to have been done in practice (probably because there has not been much research activity in recent years in the LVI area). In theory the impedance characteristics of the transformer are being identified by different excitation signals with appropriate processing. In this vein a third alternative excitation signal is that of white noise which when appropriately crosscorrelated with the resulting output signal will again yield the impulse impedance characteristics that can in turn again be transformed into the frequency domain — in practice pseudo white noise in the form of pseudo random binary signals (PRBS) is often used. Thus there are three approaches to the same end. Two of these, by using either the naturally occurring transients or injecting low level PRBS signals, are also ideal candidates for on-line monitoring investigation.

### 5.3.4 Hot-Spot Detection

The primary aim behind hot spot detection is that of prevention rather than detecting the symptoms or results of insulation breakdown. "Good" knowledge of the winding temperature can not only guarantee insulation longevity by ensuring that critical temperatures are never exceeded but also enables the transformer to be run at maximum load. The key is "good" and as hot spots can never be precisely located there are severe practical problems. The most common technique applied is that of estimating the hotspot temperature from a thermal image and measurements of oil temperatures that are easy to get at such as top of tank oil. At best this is still a coarse approximation.

More recently on experimental bases there have been reports on the development of implanted temperature devices for accurate winding temperature measurement [6,2]. The two main techniques involved firstly the use of fibre optics with crystalline type transducers and secondly the use of vapour pressure devices. Initial results appear promising but are still very much in the development stage and costs very high [7]. Clearly the main aim with thermal measurements must be one of on-line monitoring investigation.

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### 5.4 One-Line Condition Monitoring/Off-Line Measurement Systems

As previously commented the prevalent use of on-line condition monitoring is really only a matter of time. The suitability or otherwise of diagnostic techniques for on-line monitoring has already been discussed above. In the last five years there have been a spate of papers describing both experimental as well as commercial systems. The best known commercial system is the Westinghouse TMS system [3] which provides an in-

tegrated series of sensor modules connected to a local data acquisition and display unit which in turn can be linked to the station controller. Sensor inputs include:

- top of oil temperature
- load currents and voltages
- partial discharge detection by acoustic methods
- DGA analysis (hydrogen)
- status information (oil level, oil flow, etc. — 32 channels)

The local unit retains an image of the healthy operation of the transformer and flags when deviations from this state occur.

Most of the remaining papers on the subject describe experimental systems which apply specific diagnostic techniques to on-line condition monitoring. Malewski describes [5] a system which monitors overvoltages, partial discharge measurement (based on his HV impulse technique described above) and an on-line DGA. An experienced operator is still required to interpret the readings. Another system describes the combination of DGA with RF discharge measurements [9] although it is not clear what level of success was achieved. One paper concentrates on partial discharge measurement alone [10] and uses both RIV and acoustic measurement and claims that appropriate filtering can yield acceptable results. An EPRI paper describes the experience [12] of several utilities in the USA in applying diagnostic systems which include vibration signature analysis as well as RF and ultrasonic acoustic partial discharge measurement. Two papers describe Japanese experience [13,14] — one of these concentrates on corona and partial discharge detection — the other uses partial discharge and other status types of information. One paper specifically addresses the current transformer monitoring problem — this relies on power factor measurement and a hydrogen monitor.

Success on all these experimental systems is varied but clearly shows that there is a strong interest in applying such systems. Apart from DGA two of the most promising areas as previously mentioned would appear to be vibration signature analysis and the frequency response (impedance measurement) techniques.

#### 6. Dielectric Testing

This is intended as a very brief review of the more important dielectric tests being done by Eskom.

As mentioned in section 2.1.4, dielectric tests on transformer bushings are usually done during repair or tap-changer maintenance operations. This means that "tan  $\delta$ " and leakage current measurements, for example, tend to be done at irregular intervals. Consideration is now being given to implementing a more regular programme which, as regards "tan  $\delta$ " measurements, would make use of modern techniques whereby this parameter is measured in situ with the help of the bushing capacitance tap.

Routine partial discharge tests are generally not done on bushings, but consideration is also being given to this.

Current transformers are also tested irregularly — difficulties in obtaining outages being the main reason for this. Research is presently being done jointly by Eskom and the CSIR to investigate the application of on-site partial discharge measurements and the correlation of the resulting levels with the coincident generation of hydrogen and acetylene.

Dielectric tests are not done on surge arresters, but in special cases — associated with insulation pollution on metal oxide surge arresters — block currents are measured. The number of such measurements is expected to increase in the future.

"Tan  $\delta$ ", leakage current and partial discharge (in some cases) measurements are done on generator stators after routine overhauls. This has resulted in tests being done every two to three years. A database is presently being compiled to facilitate comparisons on test-by-test basis.

Dielectric tests are performed at roughly two year intervals on the various high voltage motors in power stations. These comprise tests such as "tan  $\delta$ ", winding capacitance, partial discharge and 50Hz voltage withstand measurements. A database

has been established, now making meaningful comparisons possible.

#### 7. Survey of Abnormal Voltages on the Interconnected System

##### 7.1 Scope and Motivation

Following the investigations into the recent high failure rates of transformers and current transformers in the interconnected system it was decided that long-term measurements of the following types of overvoltage should be carried out at selected sites:

1. "Slow" variations in the power frequency voltage.
2. Temporary overvoltages during faults (amplitude and duration).
3. Transients and voltage surges.

The justification for making such a survey is as follows:

1. The survey will provide a comprehensive database of typical voltage levels experienced on the network.
2. The survey will help identify the substations where high voltage stresses occur and hence the equipment which might be adversely affected.
3. Provide data which will be used to assess possible progressive ageing and degradation of solid and liquid insulation.
4. Where knowledge of ageing is limited, the information may be used to indicate where appropriate research should be done.
5. It would be a necessary complement to the in-depth "spot" measurements already done (e.g. at Pluto, Hydra and Mersey) and future such measurements.

Clearly decisions have to be made on the "depth" of information to be acquired for the three categories of overvoltage identified. Furthermore the ease with which these measurements can be made must be ascertained and the corresponding requirements and costs of the measurement and data acquisition systems must be established. The total costs of this project are not insignificant and as a result it is being tackled in two stages. The first stage, which is currently under way, is to complete a detailed technical feasibility and cost study. This will set the direction of the second stage which is the full-scale implementation of the survey.

##### 7.2 Slow Variations in Power Frequency Voltage

This is the easiest and consequently the most economical survey to carry out as it essentially uses the existing National Control instrumentation and data acquisition equipment and has no stringent requirements in terms of bandwidth and resolution. At present National Control measure this voltage via their hardware and the data is relayed through their microwave communication network to the National Control Centre at Simmerpan. The frequency of measurement can be set to any desired value and typically would be once per half hour. It is proposed to ultimately present the data in graphical form against time.

##### 7.3 Temporary Overvoltage Monitoring

One solution here is to make use of existing disturbance recorders associated with the busbar and line protection systems which record the 3-phase voltages and currents. Generally these recorders are only triggered if the protection system operates. Obviously there are many overvoltage situations which may not trigger the protection system but which need to be monitored in terms of this survey's requirements. On a few stations there are more recently installed recorders which can be readily set to trigger off present overvoltage or rate-of-change-voltage conditions. The traces of these recorders are small and consequently the data cannot be digitised with adequate resolution. Clearly, once the resolution and bandwidth for these measurements is established, a better and cost effective solution will be identified.

##### 7.4 Transients and Voltage Surges

Since transients are the most damaging voltages to the transformer insulation they are probably the most important aspects of the survey. Equally they impose the most severe requirements on the measurement and data acquisition system. In terms of the instrumentation and data acquisition system these measure-

ments are the most costly. In order to be able to completely define the requirement specification for the transient measurement system the following parameters need to be established:

1. The breakdown characteristics of insulation related to different impulse (transient) waveshapes.
2. The fastest transients that the transformer(s) are expected to be subjected to (GIS substations and isolator switching produce extremely fast (steep-fronted) transients).
3. The bandwidth of the HV divider required for the measurement of the impulses.
4. The scope of the database to be established in terms of when, where and for how long (continuous? realtime?) the measurements are to be made. Furthermore what correlation is required with other events (e.g. transformer failures).

Various automated commercial disturbance recorders are available but are very expensive (typically > R70 000). These have the capability of measuring transients with rise times of the order of 1  $\mu$ s. Careful consideration will also have to be given to the choice of voltage transducer with particular reference to performance and ease of installation.

Depending on the expense of the measuring equipment it is planned to carry out measurements at several 400kV substations. Site selection will be done on the following criteria:

- lightning activity level.
- proximity to GIS substation and capacitor banks.
- system configuration and surge impedance.

### 7.5 Conclusions

The proposed survey will provide invaluable data on which to base well considered decisions on how to deal with the recent spate of transformer failures. In addition to the prime justifications given above it will also provide useful information for the design of future system expansions and modifications to the existing network.

As mentioned the project is still in its first "feasibility" stage. It is expected, with the implementation of the second stage, that the complete exercise will last several years with the progressive release of information as the statistical database of measurements builds up over successive annual periods.

### 8. General Conclusions

This paper has presented a summary of the present and future approach that Eskom has to the subject of condition monitoring of high voltage power equipment. An overview has been provided of present maintenance procedures from which it is evident that, as with many utilities worldwide, the primary diagnostic tool for determining the condition of high voltage power equipment insulation is that of Dissolved Gas Analysis. The desire to complement DGA with diagnostic techniques which enable more ready in-field or preferably on-line assessment of insulation condition has also been demonstrated. Present research activities indicate that the most probable directions for condition monitoring are those of impedance measurement (frequency response analysis, LVI) and vibration signature analysis. The key requirements being the need to establish diagnostic techniques which are not only easily applied in the field but also lend themselves to on-line monitoring implementation. At present the primary aim will be to complement DGA which is quite firmly established and is in fact being increased in scope of application.

Also discussed is the investigation into the development of an insulation life monitor which in itself is not a direct condition monitor but an instrument to keep track of the usage of specific transformers from which the insulation condition is inferred. Such information can also be inferred from load versus time records acquired by existing supervisory control and data acquisition systems which would raise questions over the need for dedicated instruments for this purpose.

Finally it is very obvious that any decisions that are made on condition monitoring and the assessment of the stresses that high voltage power equipment may be subjected to should ideally be made with good knowledge of the types of abnormal voltages that are actually appearing in practice. To this end a programme has been set up to acquire this data so that sound

decisions can be made on the need and extent of condition monitoring requirements in the Eskom network.

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# QUALITY SYSTEMS FOR ELECTRICAL UTILITIES

Presented by  
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## CURRICULUM VITAE

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Mr. Ben Jansen received his heavy current electrical engineering education in Holland, whereafter he came to South Africa in 1961 to join Eskom's Test Department at Simmerpan.

He left Eskom in 1965 to join the transformer industry. He worked at ASEA and Bonar Long, NTC, as Production Manager and Works manager respectively.

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*Mr G B Joseph*

## 1. THE ELECTRICAL UTILITY AND ITS OPERATING ENVIRONMENT

### 1.1 Nature of business

The Electrical Utility Company is essentially a trading company. Electricity is purchased, mostly wholesale, from Eskom Regions or, in the case of Eskom Regions themselves, from the Interconnected System.

The electrical energy obtained is, through a system of transportation and transformation, modified to suit the requirements of the clients. It is sold in that form to the consumers and thus constitutes the utility's merchandise.

The electrical utility is therefore in essence a business organization, with business objectives, regardless of who owns the business at any particular time.

Electrical energy is an essential commodity to enable a modern society to function properly. The non-availability of it frequently leads to disruption and disaster in urban communities. Electrical energy therefore needs to be of high quality with adequate reliability to be of use to modern communities.

The process of transportation and transformation of electrical energy is a highly professional and specialized business. It needs adequate control over its technical and administrative procedures in order to function in a consistent and predictable manner.

The business usually has a noticeable impact on the ecology and the environment. The interface between the community and the utility needs constant attention in order to keep a good level of popular support and respect for the organization.

Lastly, the utility usually has no competition in its own environment, although its achievements can be compared to similar organizations elsewhere. The utility is usually accountable to the public, either directly or indirectly and needs to inspire a lot of confidence to be able to withstand public scrutiny.

The business of transportation and transformation of electrical energy can be a very profitable business, if managed effectively.

### 1.2 Administrative requirements

With an utility client base varying from some 1 000 to perhaps 100 000, the administration of consumer applications and service data is a considerable task. The amount of paperwork generated must be worrying to the utility management, who might wonder whether there is adequate control over the procedures that are being followed. They may ask:

- Has the administrative system not perhaps outgrown its designed base and is it still cost effective and commercially viable?
- Are we able to provide an efficient service to the public?
- Is the filing system in the archives reliable and effective?
- If our organization one day gets involved in legal action, will we be able to produce the necessary documentation from our records to support our case?
- Costing systems are at the best of times not easy to understand; do our staff know what we expect to achieve with our costing system?
- Can we always be sure that our operating costs are correctly reflected and that no costs are being hidden?
- Is our costing system the most cost effective for our operation, or is too much time being spent trying to record insignificant costs?
- Is our management information system giving us reliable information? Does it give us insufficient, adequate, or superfluous information? Is the information available in the most effective format, or does it need expert interpretation?

### 1.3 New works requirements

In the field of system expansion, management might well ask:

- With the continual expansion of the networks, are we still able to meet the demands for the foreseeable future, or will our networks ultimately collapse under overload?
- Are our planning engineers properly qualified to look after our requirements for the future?

- What would happen if they were not aware of development plans of other departments or of private enterprise?
- Could we perhaps be too late in securing adequate servitudes for main distribution lines into these areas of development?

The growth of our networks might at some time warrant the introduction of a high voltage transmission system. That decision could be difficult to time correctly.

The design of distribution feeders and substations does not always yield satisfactory operating results. Sometimes the introduction of new technology leads to a lack of compatibility of equipment and sometimes the lack of new technology leads to poor performance by industry standards.

It is often difficult to decide what equipment to choose. Some equipment looks very good on paper, but does not perform as well as expected. Other equipment looks very attractive from appearance point of view, but it fails in service after a short period of time.

In the selection of engineering equipment, the choice of manufacturers and suppliers is often bewildering. The following questions might well be pertinent:

- Should one select the supplier based on price, delivery or performance standards and how does one measure each of these?
- Is inspection and testing required upon delivery of engineering equipment, or can one trust the supplier to deliver fault free equipment? The costs of inspection and test facilities is considerable and these matters need careful consideration.
- How can one ensure the technical integrity of the equipment during storage after delivery? If one has assured that the right equipment is purchased and that it is adequately inspected and tested upon receipt, one sometimes still finds the equipment unserviceable upon release from the stores.

### 1.4 Operational requirements

The operation of an extended distribution and reticulation system is a complex task. With a variety of operational personnel and sometimes difficult operating conditions, one cannot always be sure that the operational procedures are being adhered to. Furthermore, one cannot be sure that the procedures as they stand, are still adequate for safety of personnel and equipment.

The operational equipment is also a source of concern. Is our communication equipment adequate and divided into suitable operational categories? Do we have adequate transport resources and are they of the correct operational type? When should these resources be replaced?

Do we have adequate system control facilities for the extend of our distribution system? Are our control officers always clear on the priorities to be applied in the system and are they able to optimise the fault finding process?

### 1.5 Maintenance requirements

The maintenance of distribution networks has a direct effect on the quality of supply and on the commercial viability of the utility.

Utilities have however, frequently not developed definite policies regarding the level of maintenance to be performed and the replacement of equipment.

The maintenance division of an utility often becomes the repair-shop, with the utility management frequently not knowing how effective the maintenance activity is in preventing breakdown of plant and equipment.

Do we know who is responsible for the availability (operation and maintenance) of our plant or is this responsibility lost between the various sections of the organisation?

At Eskom a 45 MVAR rotary condenser failed and had to be written off due to failure of the station battery. The battery had been inspected and serviced by the central battery department shortly before the failure. The station staff considered themselves relieved of the responsibility for the condition of the battery and the battery department staff believed that the



station staff would detect major faults in the battery, should they develop. The result was that the responsibility for the availability of plant was lost and so was the machine.

Are we satisfied that the maintenance staff has adequate knowledge and experience to maintain the equipment and do they have the necessary test equipment? Should this work perhaps be carried out by specialists from private enterprise?

Do we know the cost of planned maintenance in relation to the cost of breakdowns?

## 2. THE UTILITY MANAGEMENT SYSTEM

### 2.1 General management approach

For a business organization to function properly, it is necessary to direct all activities towards the achievement of a common goal.

It is therefore necessary for the top management to issue a Policy Statement, reflecting the Mission and the Objectives of the organization. This policy document shall give sufficient detail and demarcation of areas of endeavour to provide guidance for decision making for each member of the second tier of management.

Sound business practise dictates the use of all management resources of the organization to the full. To this end a framework of delegation of responsibility and authority needs to be set up. This framework should again have sufficient detail to clearly demarcate the areas of decision making for each member of the management team. As a general principle, decisions should be made at the lowest practical level of management and the responsibility for the consequences should accompany the authority to make the decisions.

In addition to the broad guidelines of the policy document, management should also see to the establishment of a comprehensive system of procedures and instructions, outlining standard company practise for its whole spectrum of activities. Such a system, frequently referred to as a Quality System, becomes the guide and reference for all its staff.

### 2.2 The management of administrative activities

Standard documentation needs to be designed, controlled and maintained to collect information in an orderly manner.

Documents can be kept in a central filing section, which leads to considerable traffic in documents being required by the various sections of the organization. Alternatively, each section could set up its own system, which leads to a proliferation of documents throughout the organization with the danger that their integrity cannot be ensured.

Certain documents are never used after the initial installation, but others form the basis of the agreement between the utility and its customer or are required to be kept in terms of legislative requirements. For all these documents a proper archive arrangement, with adequate control is required. This entails not only space, but also policy and security.

A proper costing system is required to keep track of costs of capital projects, of maintenance costs and of operational costs. Such system needs to be based on a clear policy and be maintained with adequate discipline, if reliable and useful results are to be obtained.

The necessary management information is to be generated and published. The management information system needs careful design to supply the essential information; no more and no less.

If all these requirements have been met and the necessary controls have been instituted, one still wonders how effective the administrative system actually is at any particular time. To provide reassurance, one needs to have an auditing system that provides management with the assurance that the system is functioning correctly.

### 2.3 The management of new works activities

The utility management needs to address the issue of how the networks of the company are required to develop in order to obtain a viable and profitable operation.

To this end a clear development policy together with a master plan, need to be drawn up to give guidance to the planning engineers.

The design engineers need to be kept up to date with the latest design practise as well as company policy concerning appropriate design parameters. Only in this way can the management be assured of consistent design practise and of technical viability of the designs. The development of a design manual to collect company design practise is usually a good start.

In organizations where consulting engineers are used to supplement in house design capability, the interface between the consulting engineer and the organization needs to be clearly defined. The consulting engineers will need to be made aware of the design practise of the utility and will have to adhere to it.

Designs need to be committed to drawings, which in turn need to be registered and issued in an orderly manner. A drawing office system with the necessary discipline must be in operation to ensure maximum effectiveness. Once the design phase is finished, the procurement phase needs attention.

A proper procurement policy needs to be developed, accommodating Company, as well as National standardization. Attention needs to be given to a vendor approval scheme to ensure that only quality goods are brought into the organization. A system needs to be developed, whereby each purchase order states adequate specifications and quality standards required. This allows the goods receiving section to perform acceptance inspection and testing, where appropriate.

### 2.4 The management of operational activities

If the distribution and reticulation system is to be operated effectively, some central control needs to be exercised. The nature and extent of this control function must be defined in control procedures. The precise performance of the various control tasks can be detailed in control instructions. This set of procedures and instructions will comprise the control policy and must be available to all staff having an interface with the control operations.

The task of switching, linking, safety testing and earthing in electrical distribution systems is frequently referred to as operating. For the safety of personnel and plant it is essential that this operating is carefully controlled. To this end a set of operating regulations must be available and their proper application must be enforced.

If the operational staff employed in distribution and reticulation systems are to be effectively used, they must have clear instructions on what they are required to do and on how to do it. General guidelines will therefore have to be available in the form of job descriptions, procedures and instructions.

### 2.5 The management of maintenance activities

The maintenance policy needs to be clearly defined (probably in terms of life cycle costs) and must be available to appropriate staff. Management information on maintenance costs needs to be collected to evaluate the effectiveness of the policy.

The extent of the maintenance work to be done and how to do it, needs to be laid down in a set of procedures and instructions. Sufficient detail should be provided to allow the staff to get it right the first time. This will prevent damage to plant and equipment and will curtail labour costs, thus contributing to a more cost effective operation of the utility.

Adequate control must be exercised over the availability and condition of maintenance tools and equipment.

## 3. THE ISO QUALITY SYSTEM

### 3.1 The need for Quality Systems

There is a world wide trend towards more stringent customer expectations with regard to quality. Most organizations, industrial, commercial or governmental, produce a product or service intended to satisfy a user's needs or requirements. Such requirements are often incorporated in "specifications". However, technical specifications may not in themselves guarantee that a customer's requirements will be consistently met.

There could for instance be deficiencies in the specifications or in the organizational system to design and produce the product or service. This has led to the development of quality management system standards and guidelines that complement relevant product or service requirements given in technical specifications.

### 3.2 The development of Quality Systems

The design of Quality Management Systems lends itself to a variety of approaches. This in turn leads to difficulties in the evaluation of the various systems available in the market place. This resulted in a request that the International Standards Organization (ISO) develop an internationally acceptable Quality System that could be universally applied without reservations about its effectiveness.

This Quality System was published under reference ISO 9000 to 9004.

## 4. THE ROLE OF THE SA BUREAU OF STANDARDS

### 4.1 The SABS and the ISO Quality Systems

South Africa has, through the SA Bureau of Standards, been a very prominent and active member of the ISO Committee for Quality Systems. Even today the SABS is making major contributions towards the development of the ISO Quality Systems.

Because of its total commitment to the ISO Quality Systems, the SA Bureau of Standards has overprinted ISO 9000 to 9004 under reference SABS 0157: Parts 0 to 4, 1987, Code of Practice for Quality Systems.

The requirements of this Code apply not only to producer, service and process industries, but also to primary, secondary and all other levels of industry, and to all sizes of companies, from the smallest to the largest multilocation, multinational operations.

The Quality Systems, in accordance with the Code, must be designed to achieve reduction of costs, to improve productivity and to instill confidence in the purchaser, and they should be simple and designed to accomplish all tasks.

### 4.2 The SABS Listing Scheme

The SABS offers an assessment and auditing service in terms of SABS 0157/ISO 9000 - 1987, called the Listing Scheme. This scheme relates only to the assessment, approval and listing of an organization, whose Quality Management System complies with the requirements of SABS 0157, and the subsequent surveillance of such organizations by SABS assessors.

The names and addresses of organizations, successfully assessed and under SABS surveillance, are included in the "SABS List of Suppliers whose Quality Management Systems comply with SABS 0157/ISO 9000 - 1987", together with the commodities or services they provide. In addition the SABS link up with ER-NII (Electronic Reference Network for Industrial Information), accessed through the BELTEL network, provides subscribers with up-to-date information on companies listed under SABS 0157, as well as information on SABS standards, SABS Mark-bearing products and manufacturers.

## 5. BENEFITS OF THE APPLICATION OF SABS 0157 TO UTILITIES

### 5.1 The utility management system and SABS 0157

The Quality System requirements of SABS 0157 apply equally well to the manufacture and supply of electrical equipment as to the generation, distribution and supply of electrical energy.

The basic benefits of Quality Management Systems are:

- reducing costs;
- improving productivity and profitability;
- providing the customer with confidence in a product, process or service.

It will not be difficult for the management of electrical utilities to identify with these benefits. Where the Quality System of SABS 0157 provides a framework for the effective control over procedures and systems, we believe that the application of this Code is a practical guide to the management requirements of the utilities.

The cost-effectiveness, productivity improvement and confidence-generating ability of a Quality Management System are substantially derived from documents and records that should be kept to the absolute minimum to achieve these objectives. A few good documents fully implemented are more effective than a large number of documents partially or ineffectively implemented.

### 5.2 Application external to the utility

If a utility were to insist that its suppliers of goods and services comply with the requirements of SABS 0157, it would enjoy the following benefits.

- It would be assured that such supplier would insist on having an adequate specification of the needs of the utility.
- It would further be assured that these needs are reviewed to ensure that the supplier was able to meet them fully.
- The supplier would have adequate control over its internal production processes to ensure inherent compliance with the product specification.
- The supplier would have adequate control over final testing and inspection for compliance with the utility specification.
- The supplier would take corrective action upon the receipt of field or service complaints, of which accurate records would be kept.

In summary, the utility would obtain the required service at the right time and at the right price from a company that is professionally managed.

All these benefits would flow from genuine compliance with SABS 0157, which, in our humble opinion, could only be substantiated by means of a SABS assessment and subsequent Listing of such company.

### 5.3 Application to the utility itself

If the requirements of SABS 0157 were to be applied to the internal production processes of the utility, the abovementioned benefits would apply to the utility as a supplier. As a result of this, the performance of the organisation would become more predictable. The organization would be more productive due to the fact that sufficiency guidance is provided for the most critical operations and processes.

The introduction of the Quality Management System means the introduction of a quality culture in the utility. It is a way of life which cannot be achieved without commitment and conviction. Experience has shown that the commitment sometimes extends to fundamental changes in the structure of the organization. Upgrading of facilities is sometimes necessary as the non-conformance reporting system becomes effective and business principles should be used in making the decisions to upgrade.

This normally leads to a substantial improvement in productivity, to a reduction in operating costs and to greater job satisfaction of the workforce.

## 6. THE FUTURE OF QUALITY MANAGEMENT SYSTEMS IN SOUTH AFRICA

Quality Management Systems have definitely taken on in South Africa. This is borne out by the fact that in excess of 300 organizations have been assessed and are under surveillance by the SABS. The fact that most corporate organizations are involved in the Listing Scheme of the SABS is perhaps not surprising. It is however interesting to note that many smaller organizations are applying for listing, e.g. rewind companies. Furthermore, a number of service organizations have applied for listing and some of them are indeed already listed.

It is obvious that all this interest, displayed by private enterprise, could not be explained as a desire to have bureaucratic systems introduced in their companies.

We are convinced that the interest is brought about by the substantial cost benefits that can be realized by effective use of this internationally accepted Quality Management System.

The SABS has already made a significant contribution towards increased productivity in South Africa through the introduc-

tion of SABS 0157 to the country's industry. It has put considerable effort into guidance and facilitation activities for many companies during the process of development of their systems.

The Bureau has also recruited and trained suitably qualified personnel as assessors for its Listing activities. Due to pressure from industry, the SABS has opened its assessor training courses to candidates from private enterprise. In this way the Bureau has made a significant contribution towards the availability of a corps of professional assessors to the South African industry.

The Mission of the SA Bureau of Standards provides for the assistance in the improvement of the long term competitive position of the South African economy, amongst others through promoting the control and the improvement of the quality of South African commodities and services.

For this reason the SABS will endeavour to provide the guidance and professional support to achieve implementation of SBAS 0157/ISO 9000 in the electricity supply industry of South Africa.

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## MRS MARIE DAVISON: ESKOM

### 1. Introduction

Eskom's commitment to strive for Quality is highlighted in the following statement made by our Chief Executive:

"Quality means different things to different people. For Eskom, who has decided on Quality as one of the things that we value, it is imperative that Quality is defined in a simple manner that is easy to understand.

To this end Eskom has accepted the concept of Quality defined as conformance to requirements, driven by a system of error prevention with the performance standard of zero deviation from requirements and the measure of Quality as the price of non-conformance.

It is necessary that everyone in Eskom commits to this concept and that Quality Management becomes a way of life that will lead us on the road to Quality".

To give effect to this commitment an Eskom Quality Advisory Board which carries the authority of the Management Board has been established. This Quality Advisory Board is made up of the functional General Managers and the line General Managers or their assistants and is chaired by the Senior General Manager. The goal of the Quality Advisory Board is "to create quality awareness and ensure availability of mechanisms that would place line managers in a position to drive quality in the organisation". Through this forum an holistic view, with quality being the central theme, will be co-ordinated and maintained.

### 2. What is Quality for ESKOM?

Against the background of numerous approaches to quality and productivity, Eskom decided to evaluate these approaches by considering the total quality-related scene, both locally and internationally.

Indepth studies, led by the Senior General Manager, addressed the different Quality philosophies and included visits to numerous acclaimed quality-focused companies. This led to the decision to develop the Eskom Quality Improvement Process (EQIP).

The Eskom approach was tailored to satisfy the organisational needs, taking present diverse quality-related activities in Eskom into consideration against the background of the various quality philosophies and the quality focused companies.

The fundamentals of the Eskom approach are derived from the widely publicised Philip B Crosby quality absolutes.



Mrs M Davison

### 3. ESKOM Quality Improvement Process (EQIP)

The EQIP has been tested and launched within the organisation. The following statements bear testimony to line managers support and enthusiasm for quality improvement:

- "To me quality combined with performance management is the only way by which a culture can be established which will guarantee superior customer service" — Johan Geldenhuys Regional Manager (Orange Free State).
- "My experience of quality so far is that it has the potential to unify all the things we do in the daily management of the Region and it is the most powerful management philosophy that I have ever encountered" — Mike O'Leary Regional Manager (Western Transvaal)

A general approach/strategy for the implementation of the quality improvement process within the organisation has been formulated. This strategy will ensure that the improvement process is taken through the organisation with the necessary energy and so eventually involve all employees. It also provides for extensive education and training in the major quality concepts to provide for a common base.

### 4. Quality Management Practices (Quality Systems)

In support of the ongoing quality improvement process, formal quality management requirements have been established by senior line management in Eskom's Generation and Distribution and Marketing Groups. These requirements deal mainly with the hard elements of the quality improvement process, such as:

- controls
- job management
- adequate work processes
- performance and integrity criteria
- identification of records etc.

The specific requirements are derived from quality management system elements such as are found in SABS 0157/ISO 9000-1987 and provide a framework within which business units should establish appropriate systems which suit the business unit's environment, promote initiative and ensure that gained experience is formally captured and shared. They also provide management with a benchmark against which to measure and adjust the quality process.

In the Generation Group, the system requirements are found in a document entitled "Operations Management Optimisation" (OMO) and the project for launching and implementing the requirements was initiated in February 1987. The implementation is scheduled for completion by the middle of 1990 when all of the power stations will have been audited, under the supervision of nationally qualified auditors. Established systems

will thereafter be continuously reviewed and updated as necessary.

In the Distribution and Marketing Group, the system requirements are found in a document entitled "Operations and Maintenance Quality Management" which is currently being launched.

The requirements covered by this document are briefly described as follows:

#### **Organisation**

- Ensuring that quality is management's responsibility for which they are accountable.

#### **Customer Relations**

- Establishing systems for customer information collection, review, analysis, correction and feedback.

#### **Communications**

- Systems for reporting and classification of incidents, occurrences and near-misses and the actions taken to prevent recurrence.

#### **Training Management and Succession Planning**

- Ensuring personnel proficiencies are achieved and maintained.

#### **Authorisation**

- Systems established to ensure that employees are formally authorised to operate plant and/or perform work which could affect the safety, availability, reliability and efficiency of plant and equipment.

#### **Procedurisation**

- Commitment to the use of formal procedures essential to safety, availability, reliability and efficiency of plant.

#### **Plant and Equipment Information and Specifications**

- Assuring that accurate information about installed and spare plant and equipment is available.
- Establishing systems for accurate procurement specifications and compliance of received products and services.

#### **Maintenance Management**

- Requirements for a formal programme of preventative and corrective maintenance.
- Procedures and resource requirements for prevention of damage or deterioration of stored or delivered plant and equipment.

#### **Periodic Testing and Calibration**

- Key items of plant and equipment to be tested periodically on a formal routine basis to assure operability.
- Control of measurement equipment and systems.

#### **Management Systems Review**

- The commitment to the process of independent audits.

Although many of these aspects may already be in place, or in various stages of development, these requirements provide for formal, auditable systems.

#### **5. SABS 0157 and Eskom Procurement**

Eskom has been actively involved in encouraging suppliers of products and services to adopt SABS 0157 within their organisations. Quality requirements are included into contractual specifications for key products and services.

The main benefits to both Eskom and the supplier are as follows:

- the supplier will achieve and sustain the quality of the product and service.
- the supplier will provide confidence to its own management that quality is being achieved and sustained.
- the supplier will provide confidence to Eskom that quality is being or will be achieved in the delivered product or service.

Eskom's monitoring activities, such as audits, surveillances and inspections are applied to determine confidence levels in the suppliers' capability to meet contractual requirements. High confidence levels have distinct financial advantages for both the supplier and Eskom.

#### **6. Conclusion**

Eskom has already made great strides to improve quality in maintenance, operations and new works, however, there is no such thing as a quick fix. Implementing a quality improvement process and developing effective quality management systems require a deliberate and sustained effort.

Taking a long term view on quality improvement supports the current culture change within Eskom.

Mr J L Rothman, Senior General Manager, states that:

"Work is a series of processes and quality improvement is a journey into the future to enrich the work processes."

This is the road to quality to which Eskom is committed.

#### **MNR A J VAN DER MERWE: BLOEMFONTEIN**

Mr President, the approach by Messrs Jansen and Joseph to quality systems in the electrical utility is rather an interesting one. Quality in management signify efficiency and this in itself result in productivity. Mr President, productivity and efficiency in itself is a very relevant topic of our time. This was discussed by the President Council and was the theme of the 1989 congress of the Institute of Town Clerks. In fact, productivity and the electrical engineer was also the inaugural address by our outgoing president, Mr Fortmann, in 1987. My appreciation and congratulation to Mr Jansen and Joseph for a paper on a topic very often avoided by engineers. Maybe because their first love is to engineer — to make things happen. Or in the words of Sir Francis Tombs — "to tame the great powers of nature".

Before one can introduce quality systems into the electrical utility, one should focus clearly on the mission of the enterprise. In this regard it was once said that if you don't know where to go, any road can lead you thereto.

In Bloemfontein glo ons dat dit 'n nastrewningswaardige doelwit vir die elektrisiteitsonderneming is om elektrisiteitsdienste van genoegsame kwaliteit, kwantiteit en kontinuïteit teen bekostigbare tariewe aan die gemeenskap beskikbaar te stel. Alhoewel dit ook waar is dat die doeltreffendheid en effektiwiteit van dienslewering altyd deur bestuur nagevolg moet word, is dit ook waar dat elektrisiteit 'n noodsaaklikheid van ons tyd is waarsonder aanvaarbare lewenstandaarde kwalik sonder meer bereik kan word. As sulks moet elektrisiteitsondernemings (in plaaslike owerhede sowel as Eskom) dikwels dienste lewer waar die insette nie noodwendig die produk regverdig nie.



*Mnr AJ van der Merwe, Bloemfontein*

Elektrisiteitsondernemings is dus gekonfronteer met die feit dat deeglik rekening gehou moet word met die behoeftes van gemeenskappe en nie soseer die winsgewendheid of ekonomiesiteit van die voorsiening nie. Aan die ander kant word die voorsiening gekonfronteer met die toenemende vraag na meer en beter dienste. Teen dieselfde standaard en effektiwiteit in ons inflasionistiese klimaat impliseer dit dus duurder dienste en hoër lewenskoste. Omtrent hierdie vraag oor hoër lewenskoste het Eric Louw eenkeer gesê: "People are always talking to me about the high cost of living. I tell them the problem is not the high cost of living — it is the cost of living high." Dit beteken uitersaak nie dat die elektrisiteitsondernemer handjies gevou moet sit en nie alle bestuurs hulpmiddele — soos SABS 0157 — moet aangryp om so wetenskaplik moontlik sy bestuursaktiwiteite te orden tot maksimale voordeel van die onderneming self nie. Die sukses van 'n onderneming is immers afhanklik van die bestuur se vermoë om kapitaal, arbeid en materiaal te vermeng en te orden om alle prosesse vaartbelyn te kry in die nastrewing van die ondernemingsdoelwit.

But, Mr President, back to quality systems in the electrical utility itself. I am of the opinion that a lot of guidelines — call it quality systems if you like — is already in service in utilities. Various electrical municipal engineers have a formal policy document defining technical goals and principles in his enterprise according to the necessary statutory laws, bylaws and ordinances. I know Eskom has its own "Bible" spelling out several procedures and criteria for effective management and engineering. It should also be borne in mind that in local authorities several staff functions (such as City Secretary, Treasury and Personnel) are associated — directly or indirectly — with the provision of electrical services. As such the municipal engineer operates in an environment interspersed with financial and administrative prescriptions and regulations. I am sure that many engineers will agree with me if I say that a lot of these hamper sound engineering processes, instead of regulating and streamlining activities. I am thus of the opinion that the municipal electricity undertaking should be run on sound business principles.

From the paper I would like to pose the following questions:

Can Mr Jansen and/or Mr Joseph elaborate somewhat on the following aspects mentioned in their paper:

- the basis upon which one municipal electrical undertaking can satisfactorily and accountably be compared with a similar sized utility in view of the facts that geographical, climatic, consumer mix differs?
- is it not just as easily possible that the transmission and transformation of electricity may still be a "very profitable business", despite a grossly ineffective management? (p. 2, item 1.1)
- does the list of 300 evaluated organizations under surveillance by the SABS, include any municipal electrical undertakings? (p. 10, item 6)
- how long is the training period involved in assessor training, what is the cost thereof, and should such a training course be viewed as the first step in the process of implementing a QMS in a municipal electrical undertaking?

Mr President, in conclusion I like to agree in general with the authors of the paper. Sound Management or quality management is a way of life instead of a set of rules and prescriptive documentation. It is sometimes much more an art, an attitude, than a science. It is this leadership approach in management that distinguish the winner from the loser and brings about affordable services.

#### MR D G N WILLIAMS: KLERKSDORP

##### Kwaliteitsisteme

Ek wil my gelukwense oordra aan mnr Jansen vir sy toepaslike referaat. Nou by die punt wat ek wil oodra: Ons woon konferensies by, verlaat die konferensies vuur en vlam en wat gebeur?

Hoeveel van ons kyk na dit wat by die konferensie gelewer is en sien waar ons dit kan toepas in ons eie ondernemings? 'n

Tipiese voorbeeld: mnr Van der Merwe het die opstel van 'n missie nou genoem, en ± 3 jaar terug het mnr Fortmann dit ook genoem.

Ek vra die vraag: Hoeveel elektrisiteitsondernemings het hierop gereageer? Het ons, dit is elke Elektrisiteits-onderneming, 'n missie en doelwit opgestel en dit wat daarop volg? Die rol van Kwaliteits-sisteme is nou verbind met verliesbeheer en produktiwiteit.

Daar is besliste voordele in al drie die komponente.

Ek dink dat die tyd aangebreek het waar ons as Elektrisiteits-ondernemings daadwerklik na onself moet kyk met betrekking tot dit wat in hierdie referaat gelewer is en die diens wat ons moet lewer en wel lewer met die eindresultaat "Diens aan die gemeenskap".

#### MR MARKUS VAN ALPHEN: AFFILIATE

Mr President, firstly my congratulations to Messrs Jansen & Joseph on an excellent paper and presentation. Quality and Cost Effectiveness are synonymous terms and are ever gaining in importance in any activity performed by man.

My contribution is limited to two conflicting yet complementary facets in quality managements viz.

- Procedurization
- Delegation of Authority

As any human activity is by definition a procedure, one should be careful not to formalise every single procedure or to negate the proper delegation of authority by the creation of a procedure.

Every procedure that is formalised must therefore be appropriate, not negate any delegation of authority, nor be of such a menial nature that it becomes an insult to the workers' intelligence.

Quality can only be effected by people. Thank you for a thought provoking paper.

#### MR TREVOR STONE: AFFILIATE

I would like to comment on quality, because everybody is talking quality these days. Quality — the definition is fit for purpose in the eyes or opinion, unreasonable as he may be, of the customer, the ratpayer or the consumer as we tend to call him. Actually, we should get rid of that word "consumer" and we should start calling him "customer". I think there is a very different sort of understanding, in my mind anyway, the difference between a consumer and a customer.



Mr Trevor Stone

You have all heard of the 6M Program which is being used to train mainly the black people to understand the business system, or the business about money and machines and all that stuff. I've got a much simpler system for you, it's called the 3P System. Its called product, paperwork and people. Now our product is "Power for the People". We want good clean juice, we want availability and we want safety. That's the product.

Then we have paperwork. We have the procedures — how do we get into the system, how do we get our electricity switched on, what's the proof of delivery all these meters and things, and how do we pay. And what happens when we have problems with those things.

And then we get to the people themselves, the policy makers, many of them sitting in this room, the planners, those guys who got a ticket for the rugby on Saturday, the producers, the providers, Eskom and the Municipalities, the suppliers to those industries, people like our company, and then of course the purchasers themselves. What alternatives do they have? What chance do you have of using gas or solar or whatever instead of electricity? What sort of reaction do we get to problems that we have when we don't pay our account when we get the price put up? Who decides what the price should be? We know who has to pay.

If I can refer to the motor industry, you can pay something between R25 000 and R125 000 for a new motor car. People pay for quality, for reliability and for an extension to their ego. We don't have that privilege in this industry, we are just paying for electricity. For it to be there all the time, for it to work when you want to switch the lights on at night. The electricity has to be there.

So we are looking at quality standards, we're looking at ISO 9000, SABS 0157. I believe SABS 0157 is going to do for industry, what NOSA has done for safety. I think it is a tremendously good publication and system and many of our companies are listed and we will continue to list those companies which are not listed at the moment.

In addition to the actual product itself, you've got the service and delivery standards. I think we all have dealings with the Building Industry and you know what it means when they tell you, your building is going to be ready on the 1st November — you better make other arrangements for Christmas.

Honest interpretation of the customers' needs, and lets face it our customers are different. I don't like my geyser being switched off at six o'clock on a winter's night when the kids have all had a bath, but I don't have any option, my friend from Edenvale sees to that.

We've also got an operating environment in this country, and one of the ladies said it to me at breakfast yesterday: "Jy weet ons wil mos nie kla nie, die diens is so sleg, maar ons wil mos nie kla nie."

Finally Mister President, I would just like to say, many people, and I don't think it is bad thing, are talking the walk. I think it is time that more of us started walking the talk.

#### **MNR DAVID WILLIAMS: KLERKSDORP**

Ons wou konferensies by, verlaat die konferensie vuur en vlam, en wat gebeur dan? Hoeveel van ons kyk na dit wat by die konferensies gelewer is en sien wat ons kan toepas in ons eie ondernemings.

Ek gee u 'n tipiese voorbeeld — mnr Van der Merwe het nou gepraat van 'n missie wat opgestel moet word. Ek wil noem, dat so drie jaar terug het mnr Fortmann 'n referaat gelewer oor produktiwiteit, en ek vra die vraag, Hoeveel elektrisiteitsonder-nemings het hierop gereageer? Dit is elke elektrisiteitsonder-neming se plig om 'n missie en doelwit op te stel en dit wat daarop volg. Kwaliteitsisteme is nou verbind met verliesbeheer en produktiwiteit. Ons weet daar is besliste voordele in al drie die komponente.

Ek dink die tyd het nou aangebreek waar ons as elektrisiteits-ondernemings, daadwerklik na ons self moet kyk met betrekking tot dit wat in die referaat gelewer is, en die diens wat ons wel lewer moet die eindresultaat-diens aan die gemeenskap.

#### **MR GORDON DAVIES: PIETERMARITZBURG**

We live in very changing times and I would like to thank Mr Jansen for a very interesting and timely paper. We are all involved in some form of joint venture, start-up or privatisation.

Now I can tell you, that when these chaps come to you from the Chamber of Industries to start up a joint venture in electricity supply, they merely add up the figures, and if there is a profit at the end of day, that is all they are concerned with.

We believe, as Electrical Engineers, that we are essential to run an electricity undertaking, and I believe that that's true. But that's not what the outside world is thinking at all. They believe that running an electricity undertaking is just a question of adding and subtracting figures.

Now if one reads the Financial Mail of last Friday, there is a statement by Wim de Villiers on privatisation and what he says there, is that at the end of the day the only thing that really matters, is the return on capital, even if the service has to drop. Now I think that is a very dangerous statement and I believe that what we have heard today gives us a background to in fact refute that sort of statement.

#### **MNR BEN JANSEN: SABS**

Eerste Marie Davison, baie dankie Marie vir jou ondersteuning, ek het met belangstelling gemerk dat jy kompetisie sien in die velde van alternatiewe energie. Ek wil net uitlig dat paraffien en hout wat ons in ons werkgroep vir laekoste behuisingelektrifisering nagegaan het, is baie duur alternatiewe. Dit is welsiswaar alternatiewe, maar alternatiewe wat daardie mense beswaarlik kan bekostig.

The Quality Advisory Board that Eskom has instituted — there is an interesting variety on the quality representative theme in 0157, and we are very pleased to note that Eskom has a firm commitment to a quality system, and we were of course aware of that.

Attie, baie dankie ook vir jou kommentaar. Die vergelyking van ondernemings en jy vra hoe kan dit gedoen word as daar dan verskillende omgewingsomstandighede is en verskillende verbruikersgroepe. Die vergelyking hoef nie noodwendig, dit moet eintlik glad nie gedoen word op die basis van finansiële werkverrigting nie. die vergelyking moet gedoen word op die basis van in watter mate die behoeftes van die verbruikerspubliek bevredig is.

Die ander vrae sal Greville vir ons hanteer.

Regarding Trevor, I see his remarks as a support for a consumer driven service concept. Also Gordon's remark supports the consumer driven aspect and we agree whole heartedly with that. Dan Dawid se opmerking, ek is baie dankbaar vir 'n positiewe aksiegerigte uitkyk, ek hoop dat sy opmerkings inslag sal vind.

Ek wil graag aan Greville Joseph oerhandig om nog so 'n paar vrae te beantwoord.

#### **MR GREVILLE JOSEPH: SABS**

First of all I would like to thank Mrs Marie Davison for the input that we got and I would like to tell the audience, we are working very very closely with Eskom as far as the quality program is being implemented and documented within South Africa. Marie, thank you very very much, it was appreciated, I can assure you.

I would also like to thank At for his piece which he gave, and when he said "I would like to ask a question", and when I broke it down it was more than one question; it was something like about three or four of them. He says how long is the training period involved in assessor training. Well at the bureau that period is a lengthy period, for we have to take people on that are trained either as technicians, technologists or engineers. This person will then accompany a trained teamleader or assessor, for a minimum period of three months as an observer, so that we can give that person the quality way in which the bureau document and implement systems.

After a three month period, we have what is known as Assessor Training Course at the bureau. This consist of two days of an Induction Course. It then is followed by two full weeks of "How do you take SABS 0157 ISO 9000 and how do you see

each and every element of that particular Code of Practice".

When we look at Electrical Undertakings we are looking at Part II because SABS 0157 the ISO 9000 is broken-up into three parts. It is broken-up into Part I which deals with design and development and services. Part II is broken-up in production and manufacturing, Part III which is inspection and final test.

So when we look at the majority of companies within South Africa we are looking at Part II which is 18 elements and we are concentrating in the Assessors Course on Part II. Once we have finished the two weeks course, each and every Assessor then sits an examination to see his theoretical knowledge which he has and the part of his practical experience and training we have given him. A further week, with an intermission of a week, is then given to documenting an evaluation of Quality Management Document where again the Assessor will sit an examination.

This particular course has been so popular that we've opened up to the whole of industry and we have had people from industry. For a few of them we have had from the Airforce, Armcor and Anglo American to name a few of the companies of the people who are attending this particular Assessors Course.

Once they have completed the course then they go onto practical training as team members of teams which go out and assess companies for compliance with SABS 0157 and also on audit teams which is most important. That is a brief summary of the training.

The next question which was part of that which At asked us is, what is the cost thereof? Well gentlemen the basic cost of training suitable technicians, technologist or engineers we have formal quality training. We have the quality control SABS 0157 assessment procedures. If you take all that I have just explained to you, that the training we put them through and the basic course which the SABS offers, the basic course is  $\pm R2\ 000$ . If you look over the spectrum and the span of time which it takes us to train somebody, you can see that the training is between 6 months to a year, depending upon the individual himself, that is the other part he asked.

Then he said, should a training course be viewed as the first step in the process of implementing a quality management system in a Municipal Electrical Undertaking. Well instead of just saying no, I will say the first step would be to set up either a seminar or a meeting with the SABS. We will come out and we will go through all the aspects and the requirements and explain what SABS 0157 involves. We will assist you from the time that we get into the company until the time that company or undertaking is approved. We view this as a partnership, that is why we say no. The first step is, you must get full commitment from your management. That once we have spoken and discussed the system with your people and you are committed to SABS 0157 from management down, it does not come from the bottom up, it percolates all the way down, yes then we can go forward and make a great success of implementing SABS 0157.

I would just like to give you a background and then I will close off. In 1992 we are going to have the whole of Europe going over onto the quality system. I have just come back from Portugal and I can assure you, the one disaster of this system is, it is taking on so fast, it is the most successful standard ever produced worldwide. There are 350 million people in Europe and what we had, is 34 countries who have now committed themselves to go over to the ISO 9000 Series. When it comes to world trade you will be able to trade with the rest of the world, if you comply with an International System. That is why the SABS did not try and rewrite or re-invent the wheel, we overprinted that system and the only difference, we call it a Code of Practice, so it is becoming very very important worldwide and as Ben showed you, those are but a few of the countries which have committed themselves. 34 have as from September, committed themselves to this system.

Just to close off, there is one question we have heard a few times here this morning, and that is, people say to us "What is in it for me, what do I get out of a system like this?" Gentlemen you being our suppliers, what is in it for you? What are you going to get out of a system like this? You are going to get consistent quality and delivery, we won't call them consumers, I agree with the gentleman, to your customers. That is what they are looking for. They want consistent quality and delivery. You are going to tell your customers: We are committed to quality. You are going to have a benchmark by which, not only us, but yourselves, will have to measure this system. Is it efficient, is it effective? That is what we are looking for.

What you are also going to have — you are going to have more control over your manufacturing, over your service, over your development, over your design, because you will be able to control it. And most important in any set-up, you are going to identify corrective action. These things that happen, we are not going to allow them to re-occur. We are going to identify them. Once you have identified corrective action, we are going to have less scrap, less re-work, and that is where all the profit is going. You are going to have less repairs and waste, etc. and when we have controlled all this, we are going to have increased productivity. And what does that mean — profits, and that is what we are all looking for today.

And your customer what are they going to get from you? They are going to receive consistent quality and consistent delivery. They are going to have more confidence in the Undertaking which is supplying them their electricity, for they know they have their situation under control.

I would like to close off. Should any person want to contact us, we are available at the Bureau. We will come throughout the country, we will travel down to that Undertaking and I can assure you, we will assist you as I said earlier, from the start until we have implemented and documented — you will implement the system and we will give you our full backing.

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## CHOICE OF kW OR kVA DEMAND TARIFF: AN UNDER-UTILISED OPPORTUNITY FOR SIGNIFICANT SAVINGS IN MUNICIPAL ELECTRICITY COSTS

By: Roger M Constable  
Manager: Power Systems Division, Yelland Engineering (Pty) Ltd.

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### MR FLU DANIEL: PRESIDENT

After graduating from the University of Natal, Roger Constable spent the early years of his Electrical Engineering career with the Electricity Supply Commission of what is now Zimbabwe.

He joined AECI Limited in South Africa in 1974 and spent the next 11 years at several of their factories. He was the Group Chief Electrical Engineer for two years before leaving to join a consulting partnership with the well-known Rapha Pretorius.

The Company became a leader in specialised engineering studies and power system measurement associated with Power Factor Correction, Harmonics, Transient Phenomena, and Power Systems Analysis. In these fields a number of highly innovative product ideas were generated.

Following the merger with Yelland Technology Holdings Ltd in 1988, several of these are now being successfully marketed. Roger Constable is now a Director of Yelland Technology Hold-

ings and the manager of Yelland's Power Systems Division. He is responsible for reactive power compensation, MV and LV switchgear and control, and specialised engineering studies.

Ladies and Gentleman, I now call on Mr Constable to present his paper.

## MR R M CONSTABLE

### SYNOPSIS

Municipalities throughout the original Eskom Rand & OFS regions are mostly subject to a kilowatt demand tariff. Since 1983, Eskom has offered an alternative kVA demand tariff which is cheaper if supply power factor is better than about 0,93 lagging.

Many municipalities already have power factors exceeding this value but still have not made the change. In other cases, it can be proved that it is economically justified to install PF correction equipment to improve power factor and achieve simple pay-back periods of less than eighteen months.

This paper outlines the potential savings achievable by changing to the kVA tariff. Specific reference is made to the "penalty" resulting from the shorter 30 minute demand interval compared with the 60 minute demand interval applied to the kW tariff. The choice of optimum power factor is analysed together with various factors affecting the capital cost of PF correction equipment. Understanding these factors will enable good investment opportunities to be identified. A further question addressed is the strategy to be adopted by Municipalities in encouraging or permitting their own consumers to change from the kW to the kVA tariff.

### 1. THE SCOPE FOR SAVINGS IN ELECTRICAL DEMAND CHARGES

Since 1983, most consumers throughout Eskom's original Rand & OFS region have had the option of an alternative kVA demand tariff which is cheaper than the prevailing tariff based on kW maximum demand.

Base charges per kW or kVA of maximum demand are currently as follows (medium voltage supply; 1989 tariff):

Monthly demand charge per kW	= R18,94
Monthly demand charge per kVA	= R17,58

For a given kW load, the two demand charges would be equal if the load power factor is 0,928 lagging or leading. (Breakeven power factor = the ratio of the kVA and kW demand charges.)

If the load power factor is less than 0,928, the kW demand tariff will yield a lower demand charge. Prior to 1983, all consumers in the old Rand & OFS region were charged on the kW demand tariff. There was no incentive to install power factor correction equipment and, in most cases, load power factors are lower than the 0,928 break-even point. Even Eskom's contractual limit of 0,85 lagging was largely ignored and many mining and industrial consumers operate at power factors well below this level.



Mr R M Constable

Most Municipalities, however, operate with power factors of 0,85 or better, depending upon the mix of domestic, commercial, light industrial and heavy industrial load, as well as the compensating effect of extensive cable networks. Where the industrial load is low, overall municipal power factors may well exceed the 0,928 break-even point and, in one case, was as high as 0,97 lagging at maximum demand.

In order to maximise the savings in demand charges possible with the alternative kVA demand tariff, it is clear that the load power factor should be increased to as near unity as economically justifiable. Savings depend critically on the corrected power factor achieved as illustrated below.

Corrected Power Factor	Savings kW vs kVA Tariff (% of kW charge)
0,928	Nil
0,95	2,3
0,98	5,3
0,99	6,2
0,995	6,7
0,998	7,0
1,00	7,2

Table 1. Increase of savings with increased power factor

### 2. THE EFFECT OF 30 MINUTE VERSUS 60 MINUTE DEMAND AVERAGING

Demand is averaged over 30 minutes for the kVA demand tariff compared with 60 minutes for the kW demand tariff. This results in an inevitable increase in the equivalent 30 minute demand, depending on the nature of the load.

Table 2 summarises the results of actual measurements carried out for various consumers during the course of our studies. It is clear that where loading is fairly steady, as in electrochemical and electro-smelting plants, the increase is small, typically less than 1%.

Many Municipalities would experience a "penalty" of less than 1% particularly where modern solid state demand (ripple) control systems exist.

In the case of Municipality B, however, the morning peak was very sharp, giving rise to a "penalty" of about 1,6%. An effective demand control system could have changed the shape of the morning peak and reduced the effective demand penalty. This is illustrated very clearly by Figure 1, which shows a typical loading profile over several days from Municipality A. The typical double hump profile existing over the weekend was flattened during the weekdays by operation of the demand control system.

In the case of Municipality C, a major problem was the presence of a steelworks comprising approximately 40% of their total load. This works operated a large open arc scrap melting furnace. These furnaces are known for their extremely irregular operation and the effect on the municipal load profile was further aggravated by the works' practice of shutting down the furnace for some 10 to 15 minutes towards the end of the 60 minute demand cycle under the influence of its own demand control system. This tended to skew the average loading between the first and second half-hours thereby contributing to the excessively high demand "penalty" recorded at the municipal incoming supply.

The increase in equivalent 30 minute demand, or "penalty" as I prefer to call it, affects potential savings on the conversion to the kVA tariff to a very significant extent. For example, for a power factor of 0,99 and a 1% increase in equivalent demand, savings are reduced by about 15%. A 22% penalty would reduce savings by nearly 30%. Figure 2 illustrates clearly the extent to which savings are affected by the choice of target power factor and the demand penalty.

The demand penalty associated with the 30 minute kVA tariff is a major factor inhibiting many consumers from changing to



## 60 MINUTE WM DEMAND

TOTAL 33 kV SUPPLY

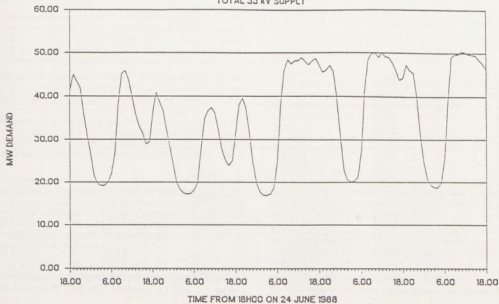


Figure 1: Overall loading at Municipality A from Friday 18h00 to Wednesday 18h00 showing effect of demand control

## SAVINGS vs P/FACTOR & DEMAND PENALTY

BASIS: 100MW LOADING, 1989 TARIFFS

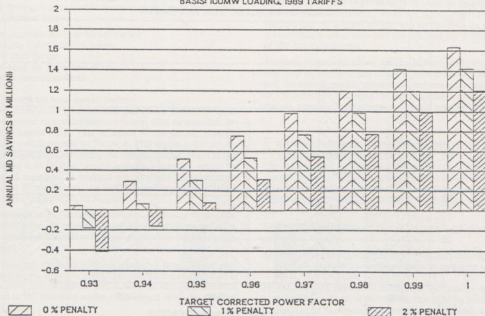


Figure 2: Influence of target corrected power factor and "demand penalty" on potential savings with the kVA demand tariff

### PAYBACK vs P/FACTOR & DEMAND PENALTY

BASIS: 100MW @ 0.85pf, R37.00/kVAr

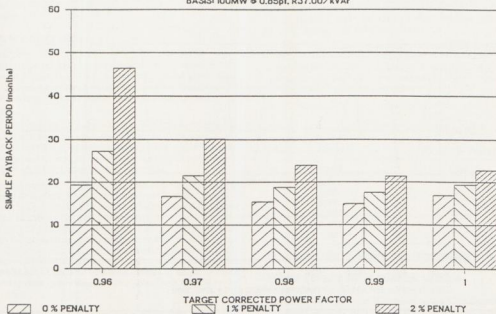


Figure 3: Typical payback on investment for a consumer with a demand of 100 MW at an initial power factor of 0,85 lagging

### PAYBACK vs INITIAL P/F FOR 1% PENALTY

BASIS: 100MW, R37.00/kVAr, 1989 TARIFFS

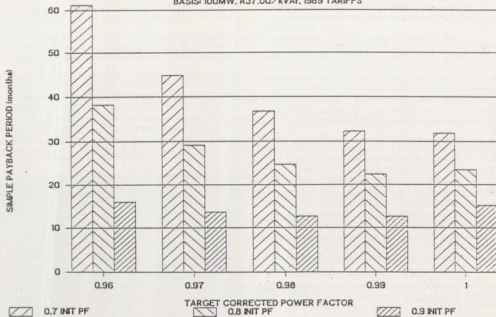


Figure 4: Influence of initial (uncorrected) power factor on project payback period

the kVA tariff. This applies particularly to the mining industry where the penalty ranges typically from 1% to 3% and where the associated uncertainty is an unacceptable factor in the economic evaluation.

We recommend that Eskom considers applying a two year moratorium on the 30 minute tariff should a consumer decide to make the change. This would allow the consumer time to recover his capital investment and to implement demand control strategies to deal with the shorter measuring interval.

Municipalities, however, generally have a predictable and stable demand profile so that the penalty can be assessed with considerable confidence. Figure 3 shows clearly how the simple payback period on capital investment is affected by the choice of target corrected power factor and the demand penalty. This suggests an optimum target for the corrected power factor of about 0,99 lagging and shows that a payback period of under two years can generally be achieved even where the demand penalty is up to 2%.

The illustrated payback periods are based on the cost of power factor correction equipment at R37,00 per kVA including GST. This rate is currently typical for medium size, medium voltage power factor correction installations not requiring specialised control switchgear. The following sections discuss a number of important factors relevant to the power system which may increase or decrease these costs.

### 3. FACTORS AFFECTING ECONOMIC PAYBACK PERIOD FOR THE PFC INSTALLATION

#### 3.1 Savings vs capital costs

It is clear from the foregoing discussion that the potential savings with the kVA demand tariff are affected primarily by the choice of target power factor and the likely penalty due to the shorter 30 minute demand averaging period.

With savings effectively fixed by these two variables, the economic payback period is affected critically by the capital costs for the necessary power factor correction (PFC) installation.

The following factors tend to increase capital costs and are discussed further below:

- Low uncorrected load power factor
- Multiple Eskom infeed points
- Low load factor
- The need for harmonic filters
- Ripple control systems

#### 3.2 Uncorrected load power factor

The lower the initial (uncorrected) load power factor, the more reactive power compensation is required, with an attendant increase in capital costs. This influence on the project payback period is well illustrated by Figure 4. This suggests that a typical Municipal situation with a 1% penalty, initial power factor of around 0,90 lagging, would achieve a payback period of around 13 months. The payback period would, however, have been over 30 months had the initial uncorrected power factor been in the region of 0,70 lagging.

Low power factors furthermore require more steps for the fine control of corrected power factor within the target range, therefore requiring additional switchgear and further increasing capital costs.

This factor has tended to inhibit a number of large (mainly mining) consumers with low power factors from installing power factor correction equipment and making the change to the kVA demand tariff. This disincentive effect should surely be reviewed by Eskom.

#### 3.3 Multiple infeed points

In terms of current Eskom metering policy throughout most of the old Rand & OFS region, it is essential that the target corrected power factor be achieved and controlled over a reasonable load range at each individual Meter Panel. Where multiple Meter Panels are provided the total required PFC must be split into a larger number of steps with more switchgear for optimal

control. The installed kVA requirement increases slightly since the design must be based on the before diversity maximum demand of each panel. Capital costs will therefore increase.

#### 3.4 Load factor

Low load factors imply a more variable load profile. In addition, monthly maximum demands may vary, requiring control of target power factor over a wider load range. More switched PFC steps may be required, increasing costs.

Fortunately, Municipalities tend to have a stable and predictable daily and weekly load pattern so that switching requirements are not severe. While the annual peak demand for most Highveld Municipalities occurs in winter, reactive power compensation need only be based on the summertime maximum demand. The difference between the summer and winter peaks is largely due to increased resistive load which requires negligible compensation.

#### 3.5 Need for harmonic filters

Large thyristor winders, process rectifiers and other large variable speed drives generate significant harmonic currents which may be amplified by the resonant circuit formed by untuned capacitors and the supply inductance.

Tuned capacitor banks (harmonic filters) are invariably needed to avoid overloading the capacitors and/or to reduce harmonics injected into the Eskom supply to within allowable limits.

The tuning reactors increase the cost of the PFC installation by 20% to 30% and also reduce operational flexibility.

The liability for suppressing such harmonic sources generally rests with the consumer who is responsible for operating harmonic generating plant. In our experience, a Municipality would very seldom be required to install tuned capacitor banks of its own. Careful study of potential harmonic interaction effects would, however, be required in these circumstances.

#### 3.6 Ripple control systems

For power factor correction equipment installed at or close to the busbar where the ripple signal is injected, no significant capacitor harmonic overloading exists for ripple frequencies below 500 Hz, and no adverse effects will be imposed on the ripple control system other than perhaps the need for minor retuning of the coupling circuit.

At ripple frequencies above 500 Hz, however, the capacitor current may be excessive due to the inverse frequency impedance and the capacitor may provide an unacceptably high loading on the generator, reducing the ripple voltage. In these circumstances, special ripple rejection circuits may be necessary.

### 4. CAN MUNICIPAL CONSUMERS PROVIDE THE NECESSARY PFC?

"If the Council can persuade/coerce its own consumers to change to the kVA tariff and install power factor correction, then the Council's own power factor will improve and it can obtain the benefits of the cheaper kVA demand tariff without any capital investment of its own."

The obvious attraction of this strategy fails on the following grounds:

- a) Unless the Municipality has one or two very large consumers, the time span for such a conversion programme is likely to be 5 years or more.
- b) The payback period on investment for smaller consumers ranges from 25 to 60 months, so that existing incentives are insufficient to persuade such consumers to change to the kVA tariff. The reason for the higher payback periods is largely due to the inherently higher cost per kVA of low voltage power factor correction equipment and generally unfavourable circumstances as discussed in Section 3.
- c) There is no way that all consumers can be persuaded to install sufficient power factor correction. Proof is to be found in those Municipalities which have always charged their own consumers on the kVA tariff in spite of being on the kW

tariff themselves. Additional VAR losses in the distribution systems means that the Municipality is, in any case, required to provide some reactive power compensation at its main infeed points.

- d) Because of diversity, the total amount of installed reactive power capacity would exceed that required for a centralised installation.

The major advantage of providing centralised reactive power compensation at the Municipality's own main intake points is that it is predictable in terms of savings, costs and timing. Having installed a centralised power factor correction system and changed to the kVA tariff, Municipalities should still provide incentives for their own consumers to install further power factor correction and change to the kVA tariff if this is not already in effect.

Any power factor correction equipment installed in this way reduces the need for the Municipality to upgrade its own power factor installation as overall municipal load grows.

## 5. OPTIMAL LOCATION/DISTRIBUTION OF REACTIVE POWER COMPENSATION ON A MUNICIPAL NETWORK

Besides the obvious cost savings in maximum demand charges, the major advantages following the installation of shunt capacitors on a power distribution system can be summarised as follows:

- Improvement in voltage regulation if the capacitor banks are automatically controlled by load and/or voltage conditions.
- Reduction of kVA loading in feeders and transformers thereby releasing distribution system capacity.
- Reduction in active and reactive power losses.

These advantages suggest that the Municipality should install its power factor correction equipment at its own primary distribution stations rather than to concentrate the installation at the main infeed points. Where the number of such primary distribution substations is relatively small, this approach is attractive in spite of a slight increase in overall cost. Each situation must be examined on its own merits to determine the optimal strategy in terms of costs of overall project costs and improvement in power system performance.

## 6. POSITIVE FACTORS SUPPORTING CONVERSION TO THE kVA DEMAND TARIFF

The presence of most of the following factors suggests very favourable conditions for conversion to Eskom's alternative kVA demand tariff. Payback periods on investment will generally be found to be in the region of 10 to 15 months.

- a) Overall intake power factor should be better than 0,85 lagging and preferably around 0,90 lagging or better.
- b) Daily and weekly loading patterns should be fairly steady and predictable. The presence of modern solid state ripple control systems is an advantage. Major consumers with fluctuating loading patterns will disturb the overall load profile and worsen the demand penalty associated with the 30 minute metering interval.
- c) The main intake and distribution voltage should preferably be less than 66kV. Higher voltages require extremely expensive switchgear in relation to the reactive power installed. The alternative is to install decentralised reactive power factor compensation at the lower voltage distribution substations.
- d) The loading per Eskom Meter Panel should be around 15 MW or better.

## 7. CONCLUSIONS

Our investigations show that many Municipalities in the old Eskom Rand & OFS region could achieve substantial savings by installing power factor correction equipment and changing to Eskom's alternative kVA demand tariff. Simple payback period on investment will commonly be in the range of 10 to 15 months.

It would appear that many Municipalities already have overall power factors of higher than about 0,93 lagging, the point beyond which demand charges become cheaper on the kVA demand tariff. No power factor correction therefore needs to be

installed and such Municipalities should consider changing to the kVA tariff without delay.

A Municipality should install power factor correction on its own distribution system rather than wait for its own consumers to install power factor correction. For lowest costs, power factor correction should be installed at the main intake points from Eskom, but additional advantages in distribution system performance are obtainable by distributing its power factor correction at the primary stepdown substations. Ripple control systems with a frequency below 500Hz are generally not a problem.

On a final note, it is an unfortunate fact that many Municipal Engineers are not particularly motivated by the financial savings possible through this, or many other money saving schemes. Their departments get no benefit from reduced costs and a lower electricity bill may even have some negative implications regarding the Municipal rating. Only a moral sense of duty, or an engineer's passion for excellence, may motivate him.

Nature of supply	Increase (%) (4)	Notes
Mine A Gold Plant	0,7	
Mine A Shaft	1,9	(1)
Mine B Shaft	2,6	(1) (2)
Mine C Reduction	0,1	
Mine C Shaft (under development)	5,1	(1)
Mine C Shaft	2,2	(1) (2)
Major electrochemical complex	0,23	
Major electro-smelting complex	0,7	
Medium furnace operator A	0,3	
Medium furnace operator B	0,8	
Medium chlorine producer	0,2	
Municipality A	0,7	
Municipality B	1,6	(3)
Municipality C (inc. Steel Works)	6,7	(2) (5)

### Notes:

1. Winder supplies from Meter Panel.
2. Demand control exaggerates increase since demand in second half hour is intentionally reduced by demand control system.
3. No ripple control system.
4. All consumers were operating under 60 minute demand tariff with varying degrees of demand control in effect.
5. Steel producer with large open arc furnace comprised = 40% of load.

Table 2: Comparison of 30 minute versus 60 minute demand metering based on actual measurements of various consumers

## MNR J D ALGERA: RUSTENBURG

Mnr die President, eerstens wil ek u graag gelukwens met die hoogste amp wat u nou beklee in die VMEO U word sterkte toegewens.

Tweedens wil ek mnr Roger Constable gelukwens met die referaat wat hy aan die Konvensie voorgedien het en die puik manier waarop hy dit gedoen het. Ek dink in die lig van die konvensiema is sy referaat baie gepas.

Ek aanvaar dat daar sekerlik lede is wat dink dat hulle geen belang het by hierdie onderwerp nie, aangesien hulle onderneemings se aanvaarf nog altyd op 'n kVA-tarief aangeslaan is deur Eskom. Moontlik het diegene nogtans iets te leer en kan dalk 'n bydrae tot die referaat lewer.



Mr J Algera, Rustenburg

By die lede wat nog moet oorskakel bestaan daar moontlik die "R-C-Factor" (resist-to-change) wat hulle verhoed om die stap te neem; maar my mening is dat hierdie referaat die deurslag behoort te gee.

Daar is reeds tydens hierdie konsensie genoem dat die doel van VMEO-lede is om elektrisiteit teen die laags moontlike koste aan die verbruiker te verskaf. Deur die besparing in aankoop-koste wat teweeggebring sal word deur 'n oorskakeling kan indirek die koste van elektrisiteitsverbruik van die verbruiker verlaag word en word so ons doel bereik.

Before going to the experience we had with the change-over in Rustenburg I would like to put the following question to Mr Constable: How would a Municipality know what the best TARGET POWER FACTOR for its specific case would be? Could he also please explain in more detail to the convention what he means by the suggestion that Eskom should apply a two year moratorium on the 30 minute tariff after change-over.

Ek wil u ook graag vertel van ons ondervinding in Rustenburg. Rustenburg het homself skielik in 'n unieke posisie bevind. Die "rus" in Rustenburg is versteur. 'n Grensnywerheidsgebied wat ontwikkel is gedurende 1970/72 en bykans ongebruik gelê het, is binne 'n paar maande vol beset.

'n Suid-Afrikaanse firma, Chrome Corp. Technology (kortliks C.C.T.) het 'n ferrochroomversmeltingsaanleg, bestaande uit twee 30 MVA-oonde in Rustenburg opgerig. Die geregistreerde maksimum aanvraag van Rustenburg is van ongeveer 52 MVA in 1988 meteens verhoog na ongeveer 120 MVA gedurende die afgelope winterseisoen.

Geleë in die ou Rand- en OVS-streek van Eskom, was die aanvraag gemeter op 'n kW- en uur-basis. Die arbeidsfaktor was dus geen "faktor" in hierdie opsig nie. Die genoemde firma C.C.T. se mededingers is direk van elektrisiteit voorsien vanaf Eskom en metering is gedoen op 'n goedkoper kVA-basis. Elektrisiteitskoste maak ongeveer 30% van die produksiekoste van die versmeltingsaanleg uit en daarom wou C.C.T. op dieselfde basis gehanteer word.

C.C.T. sou ook arbeidsfaktorverbetering toepas en hul arbeidsfaktor sou op ongeveer 0,99 na-ylend te staan kom met 'n 96% lasfaktor. Met die munisipale Maksimum-aanvraag nog op die kW-aanvraagtarief vanaf Eskom en sou 'n kVA-tarief aan C.C.T. toegesien word gebaseer op die Eskomtarief sou die Stadsraad 'n verlies van ongeveer R60 000 per maand ly. Gemeter op 'n kVA-basis kon hierdie verlies voorkom word, niteenstaande die "Straf"-persentasie a.g.v. die halfuurtydbasis.

Die "verlies" kon verder omgesit word in 'n besparing in die orde van R50 000 per maand sou die arbeidsfaktor verhoog word van ongeveer 0,92 na 0,985.

Graag wil ek ook die Wes-Transvaal-streek van Eskom bedank vir hul samewerking en hulpvaardigheid met die oorskakeling wat in Rustenburg se geval glad verloop het.

#### MR R A J FRANTZ: AFFILIATE

Three aspects of power factor compensation are considered in this contribution.

1. Benefits of power factor correction to consumers on kVA demand tariffs and the reducing benefits of correction at increased power factors.
2. Savings in distribution energy losses with alternative locations of power factor correction equipment.
3. Potential technical problems to be considered when installing power factor correction equipment.

#### Benefits of power factor correction to consumers on kVA demand tariffs

The paper primarily considers the situation of consumers on a kW tariff and the benefits they could achieve by improving their power factor and converting to a kVA tariff.

The paper does not highlight that consumers on the kVA tariff with low power factor, will achieve even greater benefits by improving the power factor than those who are having to address the option of conversion from one tariff system to another.

The situation is illustrated by means kW, kVAr and kVA vectors diagrams in the attached figures.

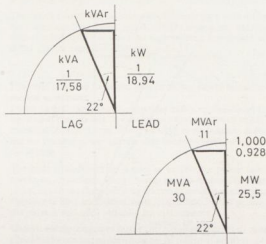


FIGURE 1: Watt/VAR relationship when kW and kVA tariffs result in equal demand charges.



Mr R A J Frantz

As an introductory reference this illustrates diagrammatically the situation where the kW and kVA tariffs result in equal demand charges as per point 1 of the paper. The load kW and kVA are inversely proportional to the kW and kVA demand tariffs respectively. (Upper diagram).

For an average municipal system the equivalent loads would be:

MVA : 30  
MW : 25,5

with a reactive component of 11 MVar (Lower diagram).

The diagram serves as a reminder that the reactive power component is significantly greater than the 7,2% reduction in power factor, being 43% of the real power (kW) component.

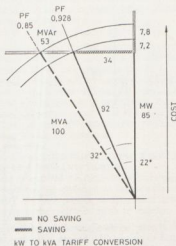
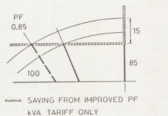


FIGURE 2

A consumer with a power factor of 0,85 (Eskom's contractual limit for the kW tariff), and for ease of analysis in percentages, a load of 100 MVA is represented.

Projecting the MVA component onto the vertical MW axis, means this axis also represents the costs and relative savings.

The lower diagram presents the consumer converting from the kW to kVA tariff. Although improving the power factor to 0,928 reduces the demand by 7,8 MVA, or 7,8%, there is no saving whilst remaining on the kW tariff. The benefits of power factor correction and conversion to the kVA tariff only begin to accrue for power factors better than 0,928 with the saving of 7,2 MVA, or 7,2%, at unity power factor as per table 1 of the paper.

The upper diagram is the situation with a kVA tariff only. Benefits accrue immediately on any improvement of power factor above 0,85. If the power factor was improved to the limit of unity then the saving as shown on the vertical axis is equivalent to 15 MVA, or 15%. This is more than double the saving that can be achieved by the consumer who is converting from the kW to kVA tariff.

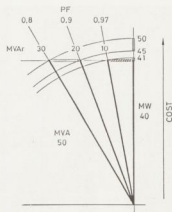


FIGURE 3  
REDUCING BENEFIT OF VAR COMPENSATION WITH INCREASING POWER FACTOR

This figure illustrates the financial reason why it is not usual to correct the power to the ultimate of unity. There are also a number of technical reasons for not doing so.

The concept is referred to in the paper (point 2 — optimum target power factor) and in Figure 4 of the paper, for example. The implication of conversion from kW to kVA tariff included in the payback histogram of the paper tends to dilute the comparison.

Figure 3 illustrates the benefit of applying the same MVar compensation to improve the same MW load from power factors of 0,8 and 0,97, the latter to the limit of unity power factor.

The vertical axis is again a measure of the costs. For compensation of 10 MVar on a 40 MW load (25%) at a power factor of 0,8, a saving from 50 to 45 is achieved (10%). For a power factor of 0,97 improved to unity the saving is only 41 to 40, i.e. 2,5%.

#### Savings in distribution losses with alternative locations of power factor correction equipment

The paper refers to the reduction in active and reactive power losses through the optimal location of reactive power compensation (Point 5).

The savings in energy charges that result from this can be significant.

To assess the savings we carried out a load flow MW/MVar balance study on a distribution network of a typical larger municipal or smaller developing national utility system.

The system is shown simplistically in FIGURE 4. It consists of an HV transmission section, typically 132kV or 66 kV, at which the bulk supply is taken, stepping down progressively to two MV distribution voltages, say 33kV and 11kV. Such a system would be typical of a utility who originally transmitted power at the higher of the distribution voltages, MV1.

For this system all the reactive current required by the loads is transmitted over the system, contributing to the energy losses in the resistive components, represented by R, of the transmission and distribution systems. For the system analysed, with conservative load and loss load factors and the present Eskom unit charge of 3,373 cents/kWh the annual cost of the transmission energy losses is in excess of R900 000. For the purpose of easy comparison this cost is given as 1 monetary unit in the figure. The cost of the reactive compensation equipment at the HV busbar to improve the power factor to 0,87 at the rate given in the paper (R37) is equivalent to 0,55 on the same monetary basis.

FIGURE 5 shows the same system, with the reactive compen-

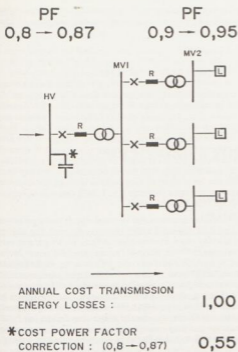


FIGURE 4.

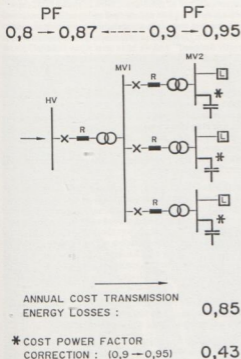


FIGURE 5.

sation equipment now installed at the load busbars, MV2, to improve the power factor from 0,9 to 0,95. This results in the power factor at the HV bulk infeed improving from 0,8 to the 0,87.

As a result of the reduction in the reactive current that needs to be transmitted over the transmission system, the annual cost of the transmission energy losses reduces to 0,85 on the same monetary unit basis of figure 5. The total cost of the reactive compensation equipment at all the MV1 busbars is 0,43, interestingly less than the cost of the equipment at the HV busbar to achieve the same infeed power factor.

Comparison of the costs of correcting the power factor at the HV or MV load busbar give the following results:

- (a) Cost of losses:  
Saving 1 - 0,85 = 0,15
- (b) Cost of reactive compensation equipment:  
Reduces from 0,55 to 0,43

The cost of the power factor correction at the MV load busbar in terms of the savings in annual transmission losses is 0,43/0,15 = 2,9 years. (Payback period).

The saving in transmission energy losses alone therefore pays for the power factor correction equipment over this period.

The savings in demand charges then become an added bonus on top of this, for the example analysed, the annual saving and demand charges with the improvement of power factor to 0,87 at the bulk infeed busbar, is equivalent to 1,8 monetary units.

The relative costs and savings will obviously vary with different system configurations, length of transmission and distribution circuits, load and loss factors, etc., but should not differ greatly from the example used.

#### Potential technical problems with installing power factor correction equipment

Power factor compensation provides many opportunities for significant cost savings. It also enables the capacity of existing transmission and distribution systems to be extended by reducing the reactive power current that needs to be supplied over the system.

The basic equipment that is used to achieve the power factor correction, capacitors, despite having been in existence for many years, has all the characteristics desired in modern engineering. Capacitors have no moving parts, require no fuel to generate the current and need virtually no maintenance.

Unfortunately the power factor correction equipment or capacitor banks can introduce a number of potential problems, affecting either the capacitors or other existing equipment in the power system. The paper mentions the obvious ones namely:

- (a) Harmonics on the power system.  
(b) Resonance at harmonic frequencies.

Both these can result in detrimental overloading of the capacitors.

Less well known problems stem from the high peak inrush currents generated when switching capacitors. This can not only cause failure of the capacitors but also the circuit breakers, particularly the small oil volume type, during closing operations. Classic problem situations are:

- (a) Back-to-back switching, energising a capacitor bank where a second bank is already connected to the busbar, the capacitive charge (current) redistributes almost instantaneously between the connected charged capacitors and the previously uncharged units.  
(b) Switching on to solid "bolted" faults on the system. The capacitive charge is discharged rapidly into the fault.

The latter situation can involve circuit breakers on normal feeder circuits for which capacitor switching duties were originally not required and for which they may therefore not be rated.

All these problems could lead to disastrous service experience with power factor correction capacitor banks which would

negate all financial benefits that should have derived from their installation. The power system factors to be considered are complex. To reduce the risks of failure, installations therefore need to be properly engineered by engineers experienced in the technology, having access to the necessary analytical tools.

#### MR R R GILMOUR: CAPE TOWN

Contribution to discussions on paper "Choice of kW or kVA demand tariff" by R M Constable.

There is probably a lot to be said in favour of Eskom's attempt to promote load conditions which will keep power factor high and therefore unnecessary excess of kVA or kW demands. At one time Cape Town encouraged power factor improvement on its motive power rate by granting a rebate on accounts while the power factor was within the range 0.9 lagging to 0.9 leading. The difficulty in applying this incentive fairly to both parties was that regular checking of the power factor was necessary which is time consuming and costly to the supply authority by way of labour and transport, usually resulting in frequent suspensions and cancellations.

Charging on a KVA BASIS on a two-part tariff could appear in principle to be an acceptable way of creating an incentive to control power factor but at least two considerations arise, namely,

1. Vector or arithmetic kVA summation in polyphase circuits?
2. The type of meter or form of measurement i.e. consideration of I above, block demand as integrated over a specified interval or a thermally operated meter.

Unless meters such as for example the Landis & Gyr trivector, Westinghouse RI or Transva, all of which cover the full range of power factor are installed, the use of any other modified kW or kWh meter also necessitates periodic checking of power factor by the supplier if accurate measurement of kVA is to be maintained. However, although kW measurement is generally more accurate and relatively cheaper to meter it would nevertheless appear that to achieve Eskom's incentive constant verification of the power factor still seems necessary.

Any comments on the points I have raised which Mr Constable may care to offer would be of interest.

#### MR CHRIS YELLAND: AFFILIATE

Mr Constable has discussed the effect of a 30 minute versus a 60 minute block demand metering interval, and has stated that in general a 30 minute block metering interval will result in a higher maximum demand than a 60 minute block metering interval. In addition, the use of thermal kVA demand metering will often result in a higher maximum demand measurement. Mr Constable has explained that the differences that may result in the measured maximum demands for the various metering systems depend on the nature of the load, the load profile, and the load factor. These, of course, vary from case to case.

The problem arises as to how to precisely quantify these differences to enable the most beneficial metering method to be adopted, or to quantify the precise financial implications of a change from a 60 minute kW demand metering system to a 30 minute kVA demand metering system.

A unique, compact and cost effective locally developed and manufactured electronic metering device, in a single package, is now available on the market, and on display in the foyer. This instrument measures, memorizes and simultaneously displays the 15 or 30 minute thermal kVA maximum demand, the 60 minute kW or kVA block interval maximum demand, and the 30 minute kW or kVA block interval maximum demand, together with the corresponding power factor at the maximum demand. This instrument provides an invaluable tool for accurate and meaningful power factor measurement, and the precise quantification of the financial implications associated with the commonly used metering systems in South Africa. Municipal engineers will find this an invaluable tool for determining their own power factor correction requirements, and for offering an

effective service to consumers, by providing sound engineering information based on actual measurement, using the various metering systems.

#### MR R CONSTABLE: AFFILIATE

I would like to address particularly my response to some of the questions that Richard Frantz raised. One of the major points that he brought up was that of course even in the kVA demand consumers, there are major savings to be made by improving power factor correction, and it is an area in our field of business that we are very heavily engaged in. Savings in this area often are much better than the conversion from kW demand that was the subject of my paper. We frequently phone Municipalities and other industrial mining consumers where pay-back periods can be as short as four months through the improvement of power factor correction, so I think that was an important point that Richard raised.

One of the other questions that he raised was: Is the target power factor of 0,99 still valid under those conditions? The answer is yes in many cases, in most cases in fact. We've got one very big customer in Natal, where in fact we raised his power factor from 0,99 to 0,998 and it was economic to do so. He had a load of some 200 MW and it was worthwhile in that particular case. In general each situation needs to be examined on its own merit. It is difficult to draw hard and fast rules. Such questions as the number of steps or switchgear required, the requirements for harmonic filters, etc. are the major cost factors, as I outlined earlier and may sometime require a power factor correction target of less than 0,99 but in general we find on a marginal costing basis that 0,99 is a good number to work on.

Now Richard also outlined very well, the benefits of power factor correction, the location of such power factor correction in the system for reducing our power system losses and one sees very clearly there that there is a very good pay-back which I didn't make any real effort to outline in my paper. When we have our own, shall we say Marketing Seminars on the subject of power factor corrections, we spend a day on it and it is really too big a subject to cover in too much detail now.

Another point he touched upon was, that perhaps power factor correction is not all good news. Now in spite of this capacitor with no moving parts and no fuel and practically no maintenance, we find that correctly designed power factor correction installation, is indeed very reliable. The key word here is "correctly designed" and we have seen many installations on a fault finding basis where inadequate care has been taken in the design.

I think somebody raised the question of what is the kind of problems of power factor correction on power systems. One of the most significant problems is in fact, problems with harmonics and even consumers who do not have harmonic generating sources in their plants, may still suffer from harmonic problems generated elsewhere in the system, and it is an area that we have to give a great deal of attention to, in ensuring a correctly designed system.

Mr Leigh asked the question about ripple control and yes, that is another area in which capacitors and power factor correction has provided or has caused problems. In general the older forms of ripple control system tended to be higher frequency. One of the common numbers was the 1 050 Hz and if this is not correctly designed, the capacitor may act as a sinc, because of its inverse frequency relationships. The capacitor may act as a sinc for the harmonic injection current, collapse the harmonic voltage, the ripple voltage on the system and result in the ripple relays not responding.

In general, the more recent generation of ripple injection equipment operates at less than 500 Hz and we find that there are very few problems in those situations.

The other question was related to metering. Metering certainly is a bag of worms on its own and I am not going to attempt to try and answer all the questions or even discuss it to any length, but in the design of power factor correction installa-



tions, we take the form of metering into account. It has an important impact on the design of an optimally controlled power factor correction installation.

I think one of the last questions raised by Mr Algera was the question of the TM Aurotorium. I don't want to discuss this in great detail. The purpose of that was merely to enable consumers to get used to controlling on a 30 minute basis. We hear the question particularly amongst Mining consumers. It is impossible for us to control on 30 minutes, there is no way we

can do it. I believe that given time, given a little bit of incentive, that anybody can find ways of reducing or operating effectively on the 30 minute period, and that was the purpose, to enable consumers to get used to a 30 minute ratio. I think I'll leave it at that for now.

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## ACCESSORIES FOR SUPERTENSION CABLES

**M A I Lang**  
Group Technical Manager,  
African Cables Ltd

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### SUMMARY

The accessories required for supertension oil filled, gas pressure and XLPE cables are briefly described and details given of the growth in supertension cable installations from 1950 to the present. The reasons for the decline in popularity of the oil filled and gas pressure cables are considered. The range of supertension cable accessories now produced locally is covered, together with details of a newly commissioned epoxy resin and moulded rubber stress cone plant.

### INTRODUCTION

Over the last ten to fifteen years we have seen substantial growth taking place in all our major cities and towns. This growth has led to an increasing demand for supertension cable to provide power to areas previously supplied by overhead lines.

In this paper I have concentrated on accessories for cables in the 66kV to 132kV voltage range as 33kV cables are now included in both SABS 97 and SABS 1339 and no cables above 132kV have yet been installed in South Africa.

In this voltage range we have nearly 1200 circuit kilometres of cable installed, of which 700 km is of the low pressure oil filled type and 100km is gas pressure cable. (1)(2)



Mr M A I Lang

### OIL FILLED AND GAS PRESSURE CABLES

Our larger municipalities have many kilometres of supertension oil filled and gas pressure cables, installations at 66kV going right back to 1953. Such systems rely on oil pressure or nitrogen gas pressure to suppress partial discharges within the insulation.

### CONTROL OF OIL PRESSURE

The gauges, valves and pipework for a typical oil filled cable installation are shown in Figure 1. Oil pressure tanks maintain the minimum pressure at the highest point of the route at a little above atmospheric. Each oil pressure gage has two contacts — an alarm contact which signals a gradual loss of pressure which would result from an oil leak, and a trip contact which closes on sudden loss of oil pressure. The latter would normally be arranged to trip the circuit breaker supplying the cable. On long cable routes or where there would be large static pressure differences because of the route profile, stop joints are provided to divide the route up into a number of discrete hydraulic sections, each section being provided with its own pressure tanks. When the cable heats up either due to increase in ambient temperature or electrical load, the impregnating oil expands and is forced into the pressure tank. On cooling, the oil returns to the cable.

### THE GAS PRESSURE CABLE

In the gas cable there is no need for this two way flow of oil, the whole cable being impregnated with a high viscosity compound and maintained at a high gas pressure.

The control panel for a typical gas cable installation is shown in Figure 2. The elimination of stop joints, particularly on installations involving large changes in route profile, was the main reason for the early popularity of the design.

### PROBLEMS WITH GAS PRESSURE CABLE

Unfortunately the high gas pressure required — about 14 bar — led to numerous leaks at joint and termination plumbs and the occasional explosion, and this led to the eventual decline in its popularity.

The W.T. Glover factory in Manchester was closed in 1970, but it is still possible to obtain cable and accessories for route diversion work when this is a more economical alternative to replacing the whole circuit.

### GROWTH IN SUPERTENSION CABLE INSTALLATIONS

The growth in the installation of cable in the 66kV to 132kV range in South Africa is shown in Figure 3.

There have been no further installations of gas cable since 1964 and very little oil filled cable has been installed since 1981. Oil filled cable installations are now limited to extension and diversion works on existing systems. What we see here in South Africa is a reflection of a trend worldwide.

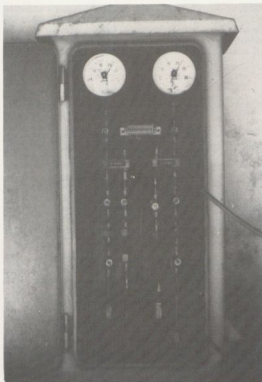


FIG. 1: Gauges, valves and pipework on oil-filled cable installation

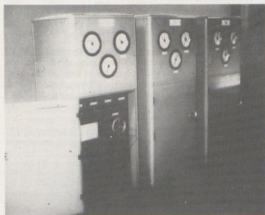


FIG. 2: Control panel for gas pressure cable installation

XLPE has almost completely superceded oil filled at 132kV and is rapidly being accepted at higher voltages.

The total lengths in circuit kilometres of oil filled, gas pressure and XLPE cable in the 66kV to 132kV voltage range installed in South Africa are shown in Figure 4.

#### MOVE TOWARDS XLPE

The main reason for XLPE cable having superceded the traditional oil filled and gas pressure cables is the relative simplicity of the system. By using a solid dielectric the need for a means of retaining the cable under oil or gas pressure now falls away.

The oil and gas cable pressure control systems shown in Figures 1 and 2 are not needed on any of the XLPE installations shown in Figures 5, 6 and 7. The elimination of pressure tanks, piping, pressure gauges with alarm and trip contacts and the associated alarm and trip circuitry is clearly a major step forward

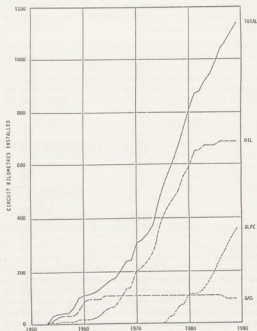


FIG. 3: Supertension (66kV-132kV) cables installed in South Africa from 1950

CIRCUIT KILOMETRES OF  
 OIL FILLED  
 GAS PRESSURE  
 AND XLPE  
 CABLE  
 INSTALLED IN SOUTH AFRICA UP TO END OF 1989

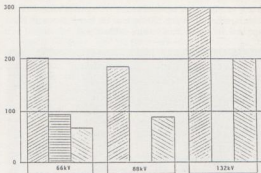


FIG. 4: XLPE Cable Terminations

and is the main reason for the move away from pressure assisted cables to XLPE.

Time will tell whether XLPE cables have the long term proven reliability of the oil filled cable — Pirelli installed the first 132kV oil filled cables in Chicago and New York in 1927, over sixty years ago, and to my knowledge they are still going strong. Sumitomo Electric installed the first 132kV XLPE cables in 1967, little more than 20 years ago. To be fair, more recent oil filled cables are operating at much higher stresses than those first Pirelli cables.

The higher design stresses used today were first adopted in 1970 less than 20 years ago.

TABLE 1

ACCESSORY	OIL FILLED	GAS PRESSURE	XLPE
OUTDOOR TERMINATION			
OIL IMMERSED TERMINATION			
SF6 TERMINATION			
STRAIGHT THROUGH JOINT			
STOP SECTIONALISING JOINT			
PRESSURE TANK/CYLINDER			
HYDRAULIC/GAS PIPING			
PRESSURE GAUGES			
ALARM/TRIP CABLING			
EARTHING LINK BOX/SVL'S			
TERMINATION MOUNTING STRUCTURES, CLEATS ETC			
OIL FILTRATION/PURIFICATION EQUIPMENT			

### ACCESSORIES

If we now look at Table 1 and consider the range of accessories required in supertension cable installations, some accessories will be required on any system, be it oil, gas or XLPE. There will be detail differences in joints and terminations for example, but earthing link boxes and similar hardware will be the same.

You will note that in South Africa we have no gas cable at -88kV or 132kV but quite a considerable route length of oil filled cable at all three voltages.

### 132kV XLPE IN SOUTH AFRICA

The first 132kV XLPE cables in South Africa were made by Sumitomo Electric and installed in Boksburg in 1975/76. In 1982 African Cables started manufacture locally of 132kV XLPE, the first installation being in the Durban area. To date in South Africa we have manufactured and installed over 86 circuit kilometres of 132kV.

Until the beginning of this year however, all accessories for these cables came from overseas.

### LOCAL MANUFACTURE

It was the high cost in Rand terms of these accessories and the first suggestions of sanctions that led the company to consider local manufacture and in June 1987, just two years ago, a Manufacturing Licence Agreement was entered into with a leading Japanese manufacturer.

In return for a substantial licence fee and a royalty payment on all locally produced accessories, the company received detailed designs of all accessories from 33kV to 132kV and perhaps more important full details of the Japanese epoxy resin casting and rubber moulding operations.

### NEWLY COMMISSIONED PLANT

General views of the recently commissioned epoxy resin casting plant and rubber moulding press are shown below in Figures 8 and 9. Metallic inserts and base flanges which are cast with the epoxy housings are given a surface "key" in the liquid honing machine shown in Figure 10. A typical component, the stress relief cage used in the epoxy housing for the outdoor termination, is shown in Figure 11.

### RESIN CASTING OPERATION

All traces of air are removed from the resin/filler system in a vacuum degasifier/mixer. After addition of the hardener and a further short degasification the unit is mounted on top of

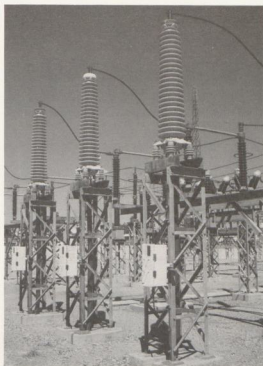


FIG. 5: 132kV Outdoor Terminations

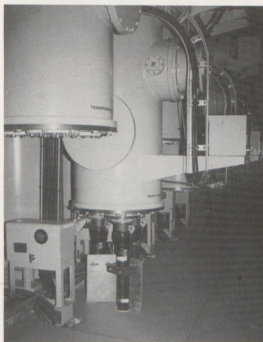


FIG. 6: 132kV SF6 Terminations

the casting tank which contains the pre-heated casting mould. The resin is poured into the mould under high vacuum.

The vacuum is broken with dry nitrogen gas and the mixer removed for cleaning. With the top flange replaced the casting tank is then pressurised at 14 bar for the first stage cure. The

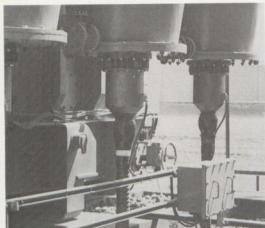


FIG. 7: 132kV Oil-immersed Terminations

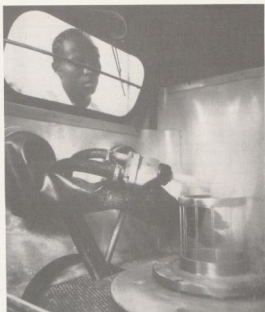


FIG. 10: Liquid Honing Machine



FIG. 8: Epoxy Resin Casting Plant

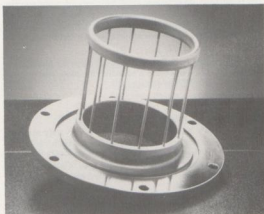


FIG. 11: Component After Honing

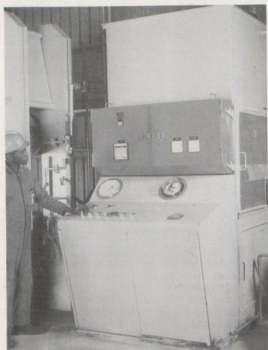


FIG. 9: Rubber Moulding Press

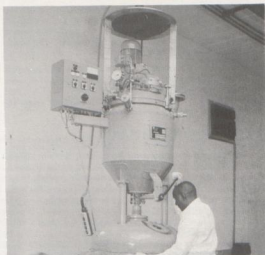


FIG. 12: Vacuum Degassifier/Mixer

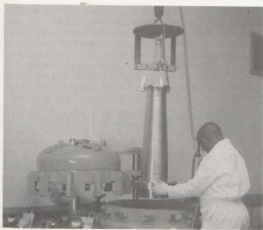


FIG. 13: Mould Being Removed From Casting Vessel



FIG. 14: Mould With Casting In Second Stage Cure Oven



FIG. 15: Oil-Filled Cable Termination

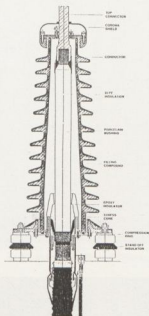


FIG. 16: XLPE Cable Termination

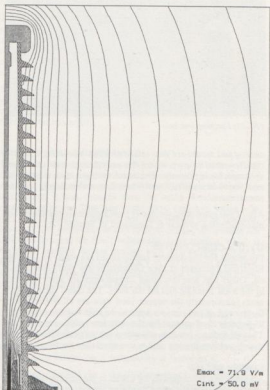


FIG. 17: Computer Generated Field Plot

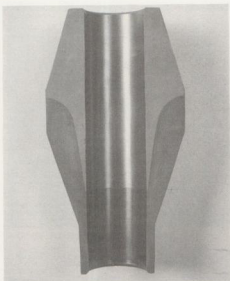


FIG 18: Sector through moulded rubber stress cone

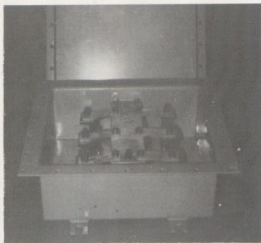


FIG 19: Earthing link box

casting and mould are then removed from the casting tank and transferred to an oven where the second stage cure takes place at atmospheric pressure. The resin casting is then demoulded and placed in a second oven where it is cooled slowly to room temperature.

After final machining the epoxy resin housing is complete. The manufacturing process is illustrated in Figures 12-14.

#### OTHER COMPONENTS

Porcelains for the outdoor terminations are made by Cullinan Electrical Porcelain at their Olifantsfontein plant near Pretoria. Other cast and machined components are made by firms in the Vaal Triangle and on the Reef. The metal spun components, particularly the copper joint cans are all made locally. By the end of the year we hope to be able to have achieved a 95 per cent local content for the complete range of accessories. The remaining 5 per cent comprises the surge diverters used as sheath voltage limiters and a few speciality electrical tapes.

#### STRESS RELIEF

All joints and terminations for cables in the supertension range employ basically the same means of stress relief.

A stress cone, built up from layers of paper in the oil filled

(Figure 15) and gas pressure cable or moulded from semiconducting and insulating rubber in the case of the XLPE cable (Figure 16), forces the zero per cent equipotential into a smooth curve and limits the radial and axial components of the electrical field to values which can be safely withstood by the insulation. The general principle is shown in the electrical field plot for an XLPE cable termination in Figure 17. The equipotential lines were generated by computer in a programme developed by the CSIR.

The programme takes into account the cylindrical symmetry of the accessory and makes allowance for the different material permittivities.

#### RUBBER STRESS CONES

A cross section of one of the moulded rubber stress cones is shown in Figure 18. The stress cones are moulded between the platens of the 100T press shown in Figure 9 in a two stage transfer moulding process.

A particular design feature of the Japanese accessories, now manufactured locally, is the compression of this stress cone into a taper in the epoxy housing by a spring loaded compression ring.

This axial compression ensures a tight radial compression of the stress cone on to the outer surface of the XLPE insulation which eliminates partial discharges at up to twice working voltage.

Before despatch, each stress cone is electrically tested with its associated epoxy housing to ensure that it is free of defects.

#### LINK BOXES

Earthing link boxes are now also made locally, but the SVL's or sheath voltage limiters are still imported. The technique of crossbonding or single point bonding to suppress sheath circulating currents was fully described in a recent paper at TECHNOSTRAT 89 (3). A typical link box is shown in Figure 19.

#### INDEPENDENT OF IMPORTS

We are now very close to being fully independent of imports for both supertension cable and accessories up to 132kV.

If for any reason, accessories for oil filled or gas pressure cables were to be unobtainable, we are confident that these too could now be made locally.

#### Acknowledgements

The author wishes to express his sincere thanks to all those at African Cables who have helped in the preparation of this paper, to Eskom and the AMEU members who have provided details from their cable records and to the City Electrical Engineer, Cape Town for photographs and slides of oil filled and gas pressure cable installations.

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#### MR R A LEIGH: JOHANNESBURG

I would like to commend Mr Lang for his initiative in choosing his particular subject matter and in his method of presentation which has given a clear understanding of developments in the local manufacture of EHV cable accessories.

Considering the reliability exhibited by XLPE cables over the past decade or so it is very unlikely that the power system operators will mourn the passing of gas and oil filled cables.

The first 88 kV oil filled cables were laid in Johannesburg in 1954 (lead sheathed) and the last in 1978. This period saw oil leak detector gangs, complete with freezing equipment, in vir-

tually constant operation on the oil cable routes. The 1954 cable had to be relaid due to poor performance of the lead sheath. By far the worst experiences relate to a pair of oil filled aluminium sheath cables installed in the busy Empire Road in Johannesburg. It was fortunate they were laid in very wide pavements which slowly became saturated in thousands of litres of oil. In one case the cable drained so very rapidly that the transformer end box failed. These experiences have caused us to be very wary in the use of aluminium sheath. One of the reasons suspected for their failure is the proximity to busy traffic with consequent vibration leading to crystallisation and sheath failure. When it was decided to abandon these cables their XLPE replacements were specified with substantial PVC sheathing over the corrugated aluminium sheath and the cables have been re-routed along back streets.

Some 50 circuit kilometres of 88 kV cable are presently in use and another 20 km are now being installed. Repairs are not due only to oil leakage problems, excavating contractors have contributed to our problems, with the inevitable two joints, even in XLPE.

The keeping of stocks of spare joints and sealing ends for vandalism and failure has always been a headache and the lead times on overseas components sometimes have caused crisis situations. (Stock of make "A" while requiring make "B").

African Cables, decision to manufacture accessories locally will hopefully provide shorter lead times and, availability in cases of emergency ex stock.

What Godsend it would be if local equipment had been available in those bad old days.

It is accepted that the present designs being manufactured originate overseas and are designed to be installed by highly skilled jointers of which, unfortunately, the country is lacking in numbers. Any design development which can be introduced to extend permissible tolerances needed on site and to accommodate inevitable human error will be welcomed. I realise this is easier said than done but jointing staff employed by Municipalities cannot keep their skill continuously honed up and any assistance manufacturers can give by component design to permit lesser skills will be welcomed.

While generally satisfied with current XLPE cable and accessories the system still has to prove itself in resisting water ingress through sheath faults or deterioration of end terminations.

No detail is given in respect of the development of locally made joints and any further information will be interesting. In many ways locally available joints may be more necessary than sealing ends, particularly for jointing oil to XLPE.

African Cables must however be congratulated on their initiative in introducing local manufacture and development which must be hailed as of major assistance to operators of EHV cable systems.

Once again Mr Lang, congratulations to you and your Company in your effort to support your industry from within the RSA.

#### **MR H R WHITEHEAD: DURBAN**

Mr President, firstly I would like to thank Mr Lang for an informative paper and at the same time congratulate African Cables on their venture in local manufacture of accessories in this specialised field. The process is obviously a sophisticated one requiring stringent controls to meet exacting tolerances. Their contribution to the reduction of our costs, particularly as a result of the poor performance of the Rand, is much appreciated and hopefully some export activity will help us further. They already have a proven track record on the manufacture of super-tension XLPE cable and it wasn't until reading Mike's paper did I realise that Durban was the first user of locally manufactured 132 kV XLPE cable. In fact Durban is fairly representative of the statistics shown regarding the various types of cable in use.

Despite its obvious advantages of XLPE my Department has not been without its share of teething troubles in the use of this



*Mr H R Whitehead, Durban*

relatively new insulation medium. It is very fortunate that great co-operation and contact is encouraged between the suppliers and the users in this country and hence problems are tackled and solved without delay.

The exclusion of moisture from external terminations is a vital requisite in Durban's environment and details of the sealing methods used would be interesting.

There are three further issues I would like to raise on the subject.

Firstly, what order of savings can be expected from local manufacture.

The second relates to the test procedures to which the accessories are subjected. We electrical engineers are cautious animals and like to be assured that the accessories we would be purchasing can withstand the rigours of the long lifespan required of the equipment. I would be pleased if you would expand on that aspect, Mr Lang.

Thirdly, as technology is advancing rapidly in this field would you like to comment on the use of moulded or pre-formed type of joint and whether a locally produced conventional joint is likely to be less costly.

#### **MR M A I LANG: AFFILIATE**

Thank you Ronald and Howard for your contribution. Both of you mentioned, at least Ronald mentioned the problem of water in joints and terminations. When XLPE cables were first introduced, it was thought that the water would not be a problem anymore, that you could leave cables in water with just a PVC sheath. That has not been proved to be the case. Up to 33 kV, in the sort of sub 39-type design, the stresses are relatively low and we don't believe the water treeing, which is really the problem we are dealing with, is a serious problem. But above 33 kV, or certainly 66 kV to 132 kV that I was talking about, it is now generally recognised that some form of impermeable water barrier, in the form of a metallic sheath ideally, is essential.

Long term voltage-time to breakdown tests carried out by the Japanese have shown that the electrical strength of XLPE cables with no metallic barrier and in a wet environment falls dramatically within time. In ten years the electrical strength of XLPE cable insulation is reduced by a factor of 4.

We recently carried out a detailed examination of samples of some Japanese 132kV cable installed in this country about 10 years ago. The cable had an aluminium sheath but water had entered the cable after a flash flood during the jointing opera-

tion. Dry nitrogen had been blown through the cable in an attempt to dry it out but it was clearly unsuccessful as a breakdown occurred after the cable had been energised for 8 years. A second breakdown occurred almost exactly a year later and a third after a further 6 months. It was after the fourth breakdown in April this year that we were asked to investigate. Knowing the history of the cable, we looked for water trees. I don't know how many of you have seen these things but I have a few slides to give you some idea of what they are like.

You need a microscope and lots of patience.

There are lead foil/PVC laminates on the market which the Japanese have been using with success but we must remember that they do not lay their cables direct in the ground as we do in South Africa. They install theirs in pipes or ducts in the road.

We have to make provision in our cables for earth fault currents generally of 25kA for 1 second and the simplest solution is to use a corrugated aluminium sheath which does both jobs.

Ronnie, your comment about leaks with that aluminium sheathed oil filled cable in Empire Road. I guess the cable was made with a longitudinally welded sheath before the advent of the continuous extrusion presses. This is our 2000 ton Schloeman press which produces the oversize tube which is then corrugated to give us the CSA or corrugated *seamless* aluminium sheath.

Howard, you commented on the need to keep moisture out of outdoor terminations. I said some nasty things in my paper about failures of gas cable joints and oil filled cable terminations so I suppose I had better come clean about the 132kV XLPE feeder to Toyota. There was a hell of an explosion on a 132kV outdoor termination in the Durban area which was caused by moisture ingress. A simple 'O' ring seal at the top of the termination had not been seated properly during installation with the result that atmospheric moisture had entered the termination during the breathing that occurred during normal lead cycling. Even with the 'O' ring incorrectly seated there was no possibility of rain water ingress. The centre phase porcelain exploded, severely damaging in turn the outer phase porcelains and the lightning arresters.

On stripping the outer phase terminations we found that the same error had been made with the 'O' ring, and in none of them over 1½ litres of water came out. This 'O' ring which probably cost 3 or 4 rand, cost the company almost a quarter of a million rand.

We have made proposals to the Japanese about a modification to the top casting which will retain the 'O' ring and prevent a recurrence of the problem.

In the light of this we are a little wary of simplifying the designs of joints and terminations to allow a bit of give and take on the part of the joiner. A joiner's job is to carry out the jointing instruction to the letter and this usually means keeping to dimensions with a tolerance no more than 1 millimetre. Before fitting the stress cone, the XLPE must be polished and circular within 0,5mm.

Howard you asked about test procedures for accessories. I assume you mean the testing of the individual joints and terminations before despatch and not the type testing that is carried out on the complete system of cable and accessories.

The majority of the component parts which are made outside are cast and machined or are metal spinnings. These are checked visually for defects and the dimensions, threads, surface finishes etc. checked by our QA department as for any other bought in material.

The porcelains are received fully tested from Cullinan. The moulded rubber stress cone and epoxy housing are tested as a unit in our high voltage lab and have to pass a high voltage withstand and partial discharge test. The epoxy housing for the SF6 terminations has to pass a helium leak test in addition.

Howard, you asked about a moulded or pre-formed type of joint and whether a locally produced conventional joint is likely to be less costly. The conventional joint is a taped design using a speciality EP rubber, coated with silicone oil. Our original intention was to produce these tapes locally but when we sent a team out to Japan we found that the tapes were made by one company for all of the Japanese cable manufacturers. Local manufacture was not feasible and we would have to, as we do now, import the tapes. We discussed this with the Japs and their recommendation was that we produce locally the factory manufactured joint which is in effect two terminations back to back in an epoxy housing.

We have very little experience with the rubber pre-moulded joint. The one I think you are referring to is made by an American company. We actually did the testing for them of the insulated type joint for use on a cross bonded system and blew up a couple in our HV Lab. We feel that much more testing under field conditions, rather than laboratory conditions is necessary before we could consider it for use in South Africa as an alternative to the Japanese taped joint or factory manufactured joint.

As for costs, you really mustn't compare the cost of a few rubber components with that of a complete joint.

Finally, a general word about the cost of the locally manufactured accessories. There is no doubt that considerable savings can be made on some component parts — the imported moulded rubber stress cone for example has a delivered cost of almost R1 000. Other cast and machined components are in fact not much cheaper because of the economies of scale. The savings, which we expect to be of the order of 30% overall, will be on shipping, import tariffs, and on double handling charges to get around sanctions.

What we have at the end of the day is a locally manufactured product, every bit as good as the imported article, employment for our own people, no loss of foreign exchange and no need to take out forward cover to make provision for an ever weakening rand.

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## THE ROLE OF THE ASSOCIATED SCIENTIFIC AND TECHNICAL SOCIETIES OF SOUTH AFRICA IN TODAY'S WORLD

By  
**L H James, President of AS and TS**

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Dit is die doel om in hierdie toespraak die geskiedenis van GW & TV, sy samestelling en sy doelwitte baie kortliks te skets en om besonderhede van die huidige en toekomstige aktiwiteite voor te lê. Voor ek dit doen, wil ek egter net my dank aan die organisateurs van hierdie konvensie betuig vir die geleentheid wat hulle in die baie besige program geskep het om die lewering van dié toespraak moontlik te maak.

AS & TS was formed in 1921 by 11 scientific and technological

societies with a total membership of approximately 2 300 members. Its first action was to acquire by way of first and second mortgage bonds a suitable building in Fox Street which it named Kelvin House.

In 1924 the AS & TS formed a separate company known as the AS & TS Broadcasting Company and began the first public daily broadcasting service in South Africa on 1st July of that year. The operating costs were recouped by way of contracts, licence





Mr L H James

fees and broadcast advertisements. Although initially technically and financially successful, financial problems soon arose due to the non-payment of licence fees and by January 1927 the Company had to cease operations, nevertheless this brief episode lasting 2½ years is of historic interest and is indicative of the pioneering spirit that prevailed in those early days.

By the year 1930 it was found that the premises in Fox Street were inadequate to provide the services required as the total individual membership of societies had increased by some 50 per cent to 3 500. The present Kelvin House in Hollard Street was built in 1931 to enable all constituent societies to be housed under a single roof.

Today there are 18 foundation and admitted societies with an individual membership of 19 000 and 45 associate, affiliate and student societies with a membership of 49 000. The total membership therefore comprises 63 societies with 78 000 members. It should be explained that foundation and admitted societies pay fees to AS & TS on a per capita basis, while associate, affiliate and student societies pay on a per society basis. The control of AS & TS is vested in the foundation and admitted societies. The AMEU is an associate society member.

From the information I have given you on the membership it is clear that AS & TS is a unique large umbrella organisation which has the potential to represent science and technology in fields of common and national interest where the joint views of societies will have a greater impact than those of individual societies.

Since its inception in 1921, AS & TS has concentrated much of its efforts in providing meeting facilities, office accommodation and secretarial services for member societies. Its work in the field of promoting science and technology has, in general, been limited to a biennial conference on a subject of national importance, and a small number of annual events such as being involved in the National Youth Science Olympiad, National Awards for Technological Achievements, etc.

In 1977 AS & TS drew up a mission statement and prepared a strategic plan designed to lead it into the 21st century. This was an important development and it signalled a change in direction in which its efforts would in future be directed.

The mission statement reads "to serve as a focal point for science and technology in South Africa; to promote co-operation among the entire scientific and engineering community so that science and technology can be advanced for the benefit of all the peoples of the country; and to serve the interests of members and member societies of AS & TS.

To fulfil this mission, five key objectives were identified. These are

1. To promote co-operation, communication, contact and understanding between all branches of science and technology.
2. To strive for improved scientific and technological education and to promote careers in science and technology for all sections of the community.
3. To provide cost effective, efficient secretarial services to member societies at a centre where members can meet on both a professional and social level.
4. To promote the image of, and enhance respect for science and technology and to stimulate international contact.
5. To provide advice and assistance to authorities responsible for science and technology planning, the allocation of resources for research and development and the protection of the environment.

In order to progress with this strategic plan, AS & TS are at present striving to achieve greater unity of overall purpose and direction amongst societies and to stimulate continued growth in membership to make its voice truly representative of the science and technology disciplines.

As a first step it is necessary to expand facilities to meet the physical requirements. Kelvin House in Johannesburg has inadequate facilities and insufficient accommodation for an expanded AS & TS. It is also poorly located as far as parking facilities are concerned. Facilities in other major centres such as Cape Town and Durban are also limited and in need of development. A trust fund was formed some years ago in anticipation of these needs and is at present providing the bridging finance for development in Johannesburg.

These developments include the purchase of a site in Johannesburg on which the AS & TS headquarters will be developed and a science and technology campus established. The site was the Republic Observatory and has a history dated back to 1904. It will be necessary to construct additional office space as well as the required meeting and social facilities which at this stage are estimated to cost R10m. This is therefore a major development which is an essential part of the strategic plan and is a project that is occupying much of the attention of the office bearers and senior staff of AS & TS.

A major fund raising effort is at present under way and although this will not require a financial commitment from member societies, it is proposed to raise substantial funds from members of member societies by way of donations and a debenture issue. In addition commerce and industry are to be approached for their support for both the capital development and the running cost of a more active AS & TS. Needless to say there must be benefits and advantages to individuals and companies that give AS & TS this support.

AS & TS is also making a determined effort to make some impact in the education field. Although progress is expected to be slow it is necessary to make continuous efforts to improve teaching standards in science and mathematics at school level and to devise teaching methods to meet today's needs.

To draw attention to what needs to be done in the education field one should be aware of the present situation. According to Government statistics, 155 000 Black pupils wrote the matriculation examination in 1988. Of these only 19 000 gained matriculation exemption standard and of these only 800 had mathematics and science as subjects. These subjects are essential for a candidate to take up a scientific or engineering course at a Technikon or University. For every 1 000 Black pupils that start school in grade 1, only one will matriculate with mathematics and science as a subject.

These figures demonstrate in a nutshell the enormous educational task facing the country and the need for urgent and innovative steps to solve the problem in the shortest possible time. It is the considered opinion of many leading industrialists that no matter how successfully we solve the political problems facing us, we shall not have stability or an improvement or enhancement of living standards in this country unless we successfully tackle the skilled man-power problem at the same time.

Dr Du Plessis mentioned this same thought in his keynote address to this Convention yesterday.

The AS & TS have set up three working groups to deal with the following aspects:-

#### 1. Careers guidance

Science and technology does not enjoy the image required to entice a sufficiently large proportion of school leavers to select a career in this field. It is necessary to devise ways and means of informing all young people in the process of making a decision on which career to follow, about the exciting and rewarding prospects of careers based on science and technology.

It is proposed to establish a careers guidance centre at the Observatory site. Such a centre will be manned by full-time experienced staff and it will be possible to move the centre to other areas for specific occasions. This is an important development.

2. The application of modern teaching technologies and computer aided instruction spring to mind and these are at present being evaluated. These include distance learning techniques and mobile classroom facilities.
3. The application technological career development programmes.

These programmes are designed to assist pupils from disadvantaged communities to receive exposure to practical science and technology and to promote their awareness and interest in technological careers. Protec is an example of this work.

There is much to be done in this field of education and as part

of its programme AS & TS is arranging an educational congress in 1990. All member societies are to be asked to make contributions to the congress so that the views of societies can be co-ordinated into plan of action necessary to meet the skilled manpower problem facing the country.

Most African countries face a bleak future because of their inability to develop their own skilled manpower requirements and use and maintain appropriate technology. AS & TS is seeking ways in which this need could best be met by the export of South African technology. A committee has been formed to develop technological links with other African states. These links could take the form of attending conferences and the delivering of appropriate technology papers as happened in July this year when it was arranged for 23 South African scientists to attend a Conference in Malawi as part of the AS & TS Afritech project.

Members of the S A Institution of civil engineers have for several years been exporting technology to neighbouring states via the ex Africa-pro Africa programme. Discussions are at present well advanced for the Afritech and ex Africa-pro Africa programmes to be combined.

#### CONCLUSION

It will be appreciated from what has been said that AS & TS has an ambitious programme to take it towards the 21st century and it looks to all its constituent member societies for their continued support. In order to co-ordinate the total effort it is clear that in future there must be closer working links between AS & TS and their members and every effort will be made to establish and maintain those links.

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## CIGRE – INTERNATIONAL CONFERENCE ON LARGE HIGH VOLTAGE ELECTRIC SYSTEMS

By

J W Gosling

Chairman: South African National Committee of Cigre

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#### 1. BACKGROUND

The International Conference on Large High Voltage Electric Systems (Cigre) is a permanent non-profit making and non-governmental international organisation with its head office in Paris.

Its aim is the development of technical knowledge and interchange of information between all countries on the generation and transmission of high voltage electric energy.

Cigre has approximately 3 800 members from 70 countries. Membership covers the whole electrical spectrum: research institutes, industry and supply utilities.

Experts and scientists all over the world feel that participation in the work of Cigre is of the highest interest. This gives them an opportunity to compare views regularly with those of colleagues involved in similar fields of work.

The usual length of time which elapses between the emergence of a new technique and its general application is thus considerably reduced thanks to the fast interchange of information concerning the first trials. Developing countries can most of the time save on experimentation and thus devote proportionally less engineering time to perfecting these techniques since they can benefit from the conclusions of technically more advanced countries.

#### 2. RUNNING OF THE ORGANISATION

Cigre is not a research organisation in itself. In working towards its aims, the organisation holds regular meetings, publishes technical papers and has a bi-monthly journal.

Its mode of operation, which shows some originality, has gradu-

ally been perfected with experience. Co-operating bodies ensure technical continuity from one meeting to the next, thus allowing the organisation to play a far more significant role than that of just a forum for discussion.

#### 2.1 Biennial Sessions

Conferences known as "sessions" are held on even numbered years in Paris.

Cigre's field of activity is divided into specialised discussion group meetings to allow the presentation of different views in detail. The definition of each of these groups can change over the years to keep pace with technical progress and to tackle new areas of concern for engineers.

The number of papers to be presented to the sessions is divided on an international basis, and strictly limited so that each paper undergoes a very tight selection process to guarantee a high technical standard.

Although South Africa has no paper allocation, five of the nine papers submitted for the 1990 Session have been accepted.

The papers are sent out in advance to all registered delegates to give them time to read them and prepare their contributions. At the sessions, the papers are neither presented verbally nor discussed individually. Before every session a "special reporter" reads all papers relevant to one discussion group. They are arranged according to the subject, and emphasis is placed on the points likely to be controversial. This method implies that all the time available is devoted to discussions, avoiding scatter in contributions.

All electrical engineers, whether from manufacturing compa-



Mr J W Gosling

nies or from generation companies, whether from industrialised or developing countries, find that at these meetings they can compare their experience and soon have reliable opinions on the suitability and application conditions of new techniques.

### 2.2 Study Committees

Study Committees serve two functions. Firstly they encourage and co-ordinate studies contributing to technical progress in their own field. Secondly they take part in the organisation of the biennial sessions by choosing the preferential subject and appointing the special reporter best qualified to handle these subjects. Their action is thus continuous from the start of a co-ordinated study to the stage of public discussion at a session when developments call for wider discussions.

Study Committees are co-ordination and reflection bodies, accessible only to a small number of well-known experts, one per country. Members are personally appointed by the Cigre governing bodies following a very tight selection on the basis of professional experience, and taking into account the need to maintain a satisfactory balance between the various groups of participants: electric equipment manufacturers, system designers and operators, university professors and researchers.

Study Committee membership is limited to 24 to ensure the efficiency of the discussions. Members are appointed for 6 years; their term of office may be renewed for 3-year periods. Proposals for renewals however are put forward on an equal footing with new candidatures.

Generally within their own field, Study Committees appoint temporary working groups to pursue in-depth studies of particular topics and where participation of a small number of specialists is required. The participants are chosen according to their qualifications and are appointed by the committee.

Study Committees and working groups meet in Paris at the time of the sessions. In years without sessions, meetings are held outside France on the invitation of National Committees. On the initiative of chairmen, extended meetings referred to as "colloquia" may occasionally be held. In 1975 meetings of two Study Committees concerned with HVDC and system planning met in South Africa. Two further Committees involved in high voltage lines and substations held meetings here in 1987.

## 3. THE ORGANISATION AND ITS GOVERNING BODIES

### 3.1 Membership

Cigre is an organisation of individuals and is of a strictly apolitical nature. There are two categories of membership:

- (i) Collective members, which may be administrative bodies, scientific and technical organisations, higher education or research institutes, and state or private companies of an industrial or commercial nature.

- (ii) Individual members, electrical engineers, professors, researchers, who take part in the work of Cigre on a personal basis.

Members meet at a General Assembly which is held during each biennial session.

### 3.2 Administrative Council

The Administrative Council consists of 30 to 40 members. They elect their president and a treasurer, and they appoint the members of the Executive Committee, a body under the authority of the Council whose function is the examination of major issues and formulation of recommendations in view of future Administrative Council decisions. The Administrative Council also elects the chairman of the Technical Committee, which body includes all Study Committee chairmen; the Administrative Council appoints two representatives to this Committee.

The Technical Committee ensures the smooth running of Study Committee work and discussion meetings at the session.

The chairman of the Administrative Council also assumes the functions of president of Cigre and chairman of the Executive Committee.

### 3.3 Secretary General

Everyday tasks are handled by the Central Office which is under the authority of a Secretary General appointed by the Administrative Council and whose tasks include ensuring liaison, internally between Study Committees and externally with major international organisations working in adjoining fields of activity.

### 3.4 National Committees

National Committees act as the Central Office correspondents in their respective countries. These Committees play an important part as intermediaries between their members and the Central Office as regards all administrative procedures: collecting membership fees, selecting and presenting proposals for papers to the session, forwarding registration, circulating information concerning the organisation of Symposia. Moreover in public relations activities they are the indispensable link with Cigre's audience in their respective countries as they alone know about the local needs and can best take into account national particularities. The chairman of the South African National Committee is a member of the Administrative Council.

## 4. STUDY COMMITTEE ACTIVITY

Study Committees have been established in the following fields: rotating machines, transformers, switchgear, HVDC links, insulating materials, cables, overhead lines, substations, interference, power system planning and development, power system analysis and techniques, and power system operation and control.

## 5. SOUTH AFRICAN PARTICIPATION

The South African Representatives on the various study Committees and Working Groups is as follows:

Administrative Council	J W Gosling	Eskom
SC11 Rotating Machines	AS Mitchell	Eskom
SC12 Transformers	—	—
SC13 Switching Equipment	—	—
SC14 HVDC Lines	—	—
SC15 Insulating Materials	—	—
SC21 HV Insulated Cables	M A I Lang (Expert)	African Cables
SC22 Overhead Lines	D H Cretchley	Eskom
SC23 Substations	J W Gosling	Eskom
SC33 Overvoltages and Insulation Co-ordination	J P Reynders	Wits
SC34 Protection	—	—
SC35 Communication	—	—
SC36 Interference	AC Britten	Eskom
SC37 Power System Planning and Development	J S Els	Eskom
SC38 Power System Analysis and Techniques	M F Haddingham (Expert)	Eskom
SC39 Power System Operation and Control	F H D Condie	Eskom

In addition to the regular members participating in their specific Study Committee, South Africans are active in Working Groups as follows:

WG14-01	(Task Force 2) Valves for Static VAR Compensators	P V Goosen	Eskom
WG22-03	Overhead Line Insulators	J P Reynders	Wits
WG22-08	Overhead Line Towers	P A Grudko	Girder-NACO
WG22-09	Overall Design	D H Cretchley	Eskom
WG22-12	Electrical Behavior of Conductors and Fittings	R Stephen	Eskom
WG23-03	Metalclad Gas Insulated Sub-Stations	R A Hopkins	Eskom
WG23-04	Design, Construction and Maintenance of Substations	L E Ryan	Eskom
WG23-06	Electrical Systems and Equipment for Power Stations	J W Gosling	Eskom
WG23-07	Measuring Transformers	F Mariani	GEC
WG33-01	Lightning	W C van der Merwe	Eskom
WG33-03	High Voltage Measuring Techniques	B C le Roux	CSIR
WG33-04	Insulator Pollution	J P Reynders	Wits
WG33-07	Dielectric Strength of Electrical Systems under Transient Conditions	H J Geldenhuys	CSIR
WG34-04	Protection	R G Coney	Eskom
WG36-01	Corona and Field Effects	A C Britten	Eskom
WG36-02	Admissible Voltages	A C Britten	Eskom
WG37-03	Factors Affecting Growth in Electrical Loads	J S Els	Eskom
WG37-07	Interaction between Transmission and Distribution System Planning	J S Els	Eskom
WG38-02	Improvement of Voltage Control	A C Paterson	Eskom
WG38-03	Power System Reliability Analysis Group	G Mijne	Eskom
WG38-04	UHV Testing facilities and Research Programmes	A C Britten	Eskom
WG39-02	Control Centre Performance	J le Grange	Eskom
WG39-03	Operational Planning Functions	W S Boeije	Eskom
WG39-04	Power Plant Control	F H D Conradi	Eskom
WG39-05	Power System Reliability	G F Bruce	Eskom

## 6. BENEFITS

The geographic isolation of South Africa does impose certain difficulties in gathering information on new techniques, performance of equipment and systems. Cigre is an ideal forum where these aspects can be discussed with specialists ensuring that past mistakes can be avoided through identification and that delays may be minimised.

South African delegates no longer play a passive role — one of listening. They now are very active participants in Cigre and as a result are becoming authoritative in certain fields which assists very largely in the rapid, high level interchange of information. This can certainly be seen in lightning research and the ensuing benefits have helped considerably in insulation co-ordination studies for substations and transmission lines. Problem areas such as altitude effects have been brought to light and it is reassuring to have interested experts from other countries checking the experimental work that has been carried out.

In entering a new technology such as HVDC, South Africa gained considerably from Cigre membership. Discussion in committee with manufacturers and users present did much to resolve mutual, technical problem areas.

The same is true about membership of the other Study Committees. Members have been able to gain confidence and this is important where new techniques and innovations have to be tried out because of the demands of our particular requirements.

Work carried out on the failure mechanisms in current transformers, transmission line compaction in urban areas, high voltage cable testing, conditioning monitoring of gas insulated switchgear and fibre optic cables in overhead ground wires, to name but a few, have benefitted both utilities and industry.

South Africa leads the world in static compensation, variable speed drives, high voltage AC and DC power transmission. The 765 kV lines are equivalent to 1 000 kV at sea level and the GIS substations are far in advance of anything built elsewhere. The HVDC Cahora — Apollo scheme, beset by problems other than technical, it still the largest of its type in the world with respect to voltage, power transmission capability and distance.

The emphasis on systems — particularly on those involving the time domain — has brought about restructuring and rationalising of three study committees having South African membership. As a result planning, development, analysis techniques, operation and control of power systems are now being more effectively addressed.

The Cigre organisation enjoys world-wide authoritative respect, and its publications are now being quoted by other organisations in disputed matters. In addition, international standards organisations, in particular the International Electrotechnical Commission (IEC) are using Cigre as a reference source.

What benefits can be foreseen for the future? Attention is being given to plant and system performance, more particularly availability, reliability, utilisation, maintainability, dependability and security. Environmental topics are coming to the fore and already co-operative reports with the World Health Organisation are answering queries on the health aspects of electromagnetic fields and radiation on humans and animals.

# REPORTS / VERSLAE

## REPORT OF THE SECRETARY FOR THE YEARS 1987 AND 1988

Bennie van der Walt

## VERSLAG VAN DIE SEKRETARIS VIR DIE JARE 1987 EN 1988

**MNR BENNIE VAN DER WALT: SEKRETARIS VMEO**  
Meneer die President, ek stel voor dat die Sekretariële Verslag, wat reeds 'n paar maande in die hande van lede is, as gelese aanvaar word.

Ek wil graag vir mnr Fortmann, die uittrede President van harte bedank vir die aangename twee jaar termyn, vir sy baie deeglike werk wat hy te alle tye gedoen het. Alwin ek moet eerkwaar sê dit was 'n plesier om saam met jou te werk in 'n span. Jy verdien nou 'n rustyd.

Mnr Fred Daniel, dit lyk vir my u kom altyd so by die diepkant in. U het 'n paar jaar gelede in besondere omstandighede die leisels moes oorneem as die Hoof Elektrotegniese Ingenieur van Kaapstad en verlede jaar in 'n ommesientjie moes u die leisels oorneem as aangewese President van die VMEO, wat beteken het u moes onmiddellik die reëlings van hierdie Konvensie op u skouers geneem het. Maar u het goed geprester en ons aanskou vandag u harde werk in die vorm van hierdie grootste Konvensie ooit.

Mnr Daniel, baie dankie vir u samewerking tot dusver en ek hoop en vertrou dat ons ook in die toekoms 'n baie aangename verhouding sal geniet. Dit is lekker om met u en u personeel saam te werk.

My hearty congratulations to Mr Charles Adams. He is actually very shy, but we hope that Port Elizabeth will show up in good time and we trust that he will become one of our outstanding Presidents of the AMEU. Once again congratulations.

I also feel that I should mention the assistance we get from the Affiliates Committee, under the guidance of their Chairman, Brian Madeley. The Affiliates is in a different shape, they now do matters very orderly and they approach the Executive Council for guidance and vice versa, with the result we see more and more Affiliate members' faces at our get-togethers. I do want to say thank you very much for the assistance that we received from the Affiliates as far as advertising in our Journals and newsletters are concerned, also as far as sponsorships are con-

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 1987 and 1988.

### EXECUTIVE COUNCIL

Mr A H L FORTMANN — Boksburg  
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 50th Convention held in Cape Town in 1987:

Dr: N S Botha



President Fred Daniel saam met Bennie van der Walt, Sekretaris van die VMEO

cerned. We are very appreciative of that. Baie, baie dankie.

Ek wil my dank betuig en beaam wat mnr Fortmann vanmore gesê het van die Uitvoerende Raad en van mnr Jules van Ahlten vir hulle loyaliteit teenoor die VMEO en teenoor myself. Baie hartlik dankie vir u vriendelike samewerking wat ons te alle tye geniet. Ek waardeer dit en ons hoop en vertrou dat ons steeds vorentoe sterker sal saamwerk om die VMEO steeds groter uit te bou.

Namens die Uitvoerende Raad van die Vereniging van Elektrisiteitsondernemings van Suid-Afrika lê ek met genoë die volgende beknopte verslag van die aktiwiteite van die VMEO vir die finansiële jare 1987 en 1988 aan u voor.

### 1. UITVOERENDE RAAD

1.1 Mnr A H L FORTMANN — Boksburg  
PRESIDENT

Tesame met hulle raadslede wat deur die betrokke Elektrisiteitsondernemings genominee word, is die volgende Ingenieurslede tydens die 50ste Konvensie, gehou in Kaapstad, in 1987 verkies tot die Uitvoerende Raad:

1.2 Bloemfontein President Elect/  
Aangewese President

Messrs/Mnre: C E Adams  
M P P Clarke  
E G Davies  
F L U Daniel  
J E Heydenrych  
J A Loubser  
K J Murphy  
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: D H Fraser  
P J Botes  
K G Robson  
J K von Ahlften

During the period under review Messrs Fraser, Robson and Von Ahlften resigned from the Executive Council on leaving the municipal service. They were all past presidents, and thus no vacancy was to be filled.

#### CO-OPTED MEMBERS

Messrs/Mnre: J D Dawson  
J G Malan

Dr Botha became the Town Clerk of Bloemfontein and as result resigned from the Executive Council.

Mr F L U Daniel — Cape Town was elected to fill the vacancy of President Elect.

Mr C E Adams — Port Elizabeth was elected to fill the vacancy on the Standing Committee.

Mr C J Scherman — Pretoria was elected to fill the vacancy on the Executive Council.

Mr J K von Ahlften was appointed Technical Secretary of the AMEU.

The Executive Council held five meetings, and the Standing Committee four meetings.

#### BRANCHES

The five branches held regular meetings to discuss matters of mutual interest. Their office bearers for 1988 were as follows:

##### HIGHWELD BRANCH

Chairman/Voorsitter  
Secretary/Sekretaris

##### GOOD HOPE BRANCH

Chairman/Voorsitter  
Secretary/Sekretaris

##### NATAL BRANCH

Chairman/Voorsitter  
Secretary/Sekretaris

##### EASTERN CAPE BRANCH

Chairman/Voorsitter  
Secretary/Sekretaris

##### FREE STATE/NORTHERN CAPE BRANCH

Chairman/Voorsitter  
Secretary/Sekretaris

The Executive Council received an application for the establishment of a sixth branch in Northern Transvaal.

Due to the fact that the required number of members did not come up to expectations, the request was not entertained.

The Executive Council resolved however that sub-branches may be formed and that the proposed amendments to the Constitution should be confirmed by the Convention.

Port Elizabeth  
Randburg  
Pietermaritzburg  
Cape Town/Kaapstad  
Middelburg Tvl  
Benoni  
Somerset West/Wes  
Krugersdorp

1.3 Ingevolge die Grondwet is die volgende voormalige presidente met hulle raadslede ook lede van die Uitvoerende Raad:

Durban (Honorary Member/Erelid)  
Roodepoort  
East London/Oos-Londen  
(Honorary Member/Erelid)  
Springs (Honorary Member/Erelid)

1.4 Gedurende die periode onder oënskou het mnre Fraser, Robson en Von Ahlften bedank van die Uitvoerende Raad aangesien hulle die munisipale diens verlaat het. Hulle is almal voormalige presidente en gevolglik was daar geen vakante poste gelaat nie.

#### 1.5 GEKOÖPTEERDE LEDE

Uitenhage (Honorary Member/Erelid)  
Kempton Park

1.6 Dr Botha het Stadsklerk van Bloemfontein geword en gevolglik bedank van die Uitvoerende Raad.

1.7 Mnr F L U Daniel — Kaapstad is verkies in die vakante pos van Aangewese President.

1.9 Mnr C E Adams — Port Elizabeth is verkies in die vakante pos op die Dagbestuur.

1.9 Mnr C J Scherman — Pretoria is verkies in die vakante pos op die Uitvoerende Raad.

1.10 Mnr J K von Ahlften is aangestel as Tegnieuse Sekretaris van die VMEO.

1.11 Die Uitvoerende Raad het vyf vergaderings gehou en die Dagbestuur vier vergaderings.

#### 2. TAKKE

Die vyf Takke het gereed vergader om sake van gemeenskaplike belang te bespreek. Hulle ampsdraers vir 1988 was soos volg:

##### 2.1 HOËVELDTAK

— W J Dauth — Volksrust  
— J A Ehrlich — Standerton

##### 2.1 GOEIE HOOPTAK

— F L U Daniel — Cape Town/Kaapstad  
— A C T Frantz — Pinelands

##### 2.3 NATALTAK

— M Hoffenberg — Port Shepstone  
— E G Davies — Pietermaritzburg

##### 2.4 OOS-KAAPTAK

— A J Richards — Grahamstown  
— P Harpestad — King Williamstown

##### 2.5 VRYSTAAT/NOORD-KAAPTAK

— C A H Marais — Parys  
— R F Davidson — Bloemfontein

2.6 Die Uitvoerende Raad het 'n aansoek vir die stigting van 'n sesde tak in Noord-Transvaal, ontvang.

As gevolg van die feit dat die vereiste getal lede nie gevind kon word nie, kon aan die versoek nie voldoen word nie.

Die Uitvoerende Raad het egter besluit dat sub-takke gestig behoort te word en derhalwe sal die Konvensie gevra word om die voorgestelde wysigings met betrekking tot die Grondwet, goet te keur.

**COMMITTEES AND REPRESENTATIVES**

The following subcommittees and representatives were appointed by the Executive Council.

**STANDING COMMITTEE 3.1 DAGBESTUUR**

A H L Fortmann plus Councillor/Raadslid  
F L U Daniel plus Councillor/Raadslid  
M P P Clarke  
C E Adams

**PAPERS COMMITTEE 3.2 REFERATEKOMITEE**

A H L Fortmann — Convenor/Saamroeper  
F L U Daniel

**FINANCE COMMITTEE 3.3 FINANSKOMITEE**

J A Loubser  
A H L Fortmann  
J K von Ahlften — Convenor/Saamroeper  
plus Councillor/Raadslid

**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  
C E Adams  
M P P Clarke  
E G Davies  
F L U Daniel  
K J Murphy  
H R Whitehead

**SABS CO-ORDINATING COMMITTEE 3.6 KOÖRDINERENDE KOMITEE: SABS**

A J van den Berg — Convenor/Saamroeper  
J A Loubser  
J E Heydenrych

**TECHNICAL TRAINING COMMITTEE 3.7 KOMITEE: TEGNIESE OPLEIDING**

J D Dawson — Convenor/Saamroeper  
E G Davies  
A H L Fortmann  
J E Heydenrych  
J A Loubser  
K J Murphy  
A T van der Merwe

**SATEPSA MAIN POWER SUBCOMMITTEE 3.8 SATEKG HOOF-KRAGONDERKOMITEE**

P J Botes — Convenor/Saamroeper  
C E Adams  
TEE/ESI Johannesburg

**PUBLICITY 3.9 PUBLISITEIT**

M P P Clarke — Convenor/Saamroeper  
D Briers  
E G Davies  
I Hobbs  
K J Murphy

**HIGH VOLTAGE CO-ORDINATING COMMITTEE 3.10 KOÖRDINERENDE HOOGSPANNINGSKOMITEE**

Representative/Verteenwoordiger  
D H Fraser  
F L U Daniel

**WORLD ENERGY CONFERENCE 3.11 WÊRELDKRAGBRONKONFERENSIE**

Representatives/Verteenwoordigers  
M P P Clarke  
C E Adams

**ELECTROLYTIC CORROSION COMMITTEES 3.12 KOMITEES: ELEKTROLITIESE KORROSIE****MAIN COMMITTEE 3.12.1 HOOFKOMITEE**

Representatives/Verteenwoordigers  
A J van den Berg  
J E Heydenrych

**3. KOMITEES EN VERTEENWOORDIGERS**

Die volgende onderkomitees en verteenwoordigers was benoem deur die Uitvoerende Raad.

WITWATERSRAND REGION 3.12.2 WITWATERSRANDSE STREEK

Representatives/Verteenwoordigers

A J van den Berg

J E Heydenrych

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

D Briers

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

C E Adams

J D Dawson

AMEU/ECA/ESKOM LIAISON COMMITTEE 3.13 VME/EKV/ESKOM SKAKELKOMITEE

Representatives/Verteenwoordigers

J A Loubser

J K von Ahlften — Reporter/Verslaggewer

J E Heydenrych

THE NBRI STEERING COMMITTEE ON SOLAR ENERGY AND ENERGY CONSERVATION IN BUILDINGS AND BUILTUP ENVIRONMENT 3.14 DIE NBRI LOODSKOMITEE OOR SONENERGIE EN ENERGIEBEWARING IN GEBOUE EN DIE BEBOUDE GEBIEDE

Representatives/Verteenwoordigers

F L U Daniel

D Briers

CSIR/NEERI ADVISORY COMMITTEE 3.15 WNNR/NNEI-ADVIESKOMITEE

Representatives/Verteenwoordigers

J E Heydenrych — Primarius

A J van den Berg — Secundus

SANCI 3.16 SANKV

Representative/Verteenwoordiger

F L U Daniel

AMEU/ILESA/SANCI STREET LIGHT ADVISORY COMMITTEE 3.17 VMEO/IVISA/SANKV STRAATLIG ADVIESKOMITEE

Representatives/Verteenwoordigers

A H L Fortmann

J E Heydenrych

A J van den Berg

NEERI POWER SUB-COMMITTEE 3.19 NNEI-KRAGONDERKOMITEE

Representative/Verteenwoordiger

M J Human

COMMITTEE: STATUTORY REGULATIONS 3.20 KOMITEE: STATUTÊRE REGULASIES

J E Heydenrych — Convenor/Saamroeper

C E Adams

F L U Daniel

TRAINING COUNCIL 3.21 OPLEIDINGSRAAD

Local Government Training Act

No. 41 of 1985

National co-ordinating

training committee

Wet op Plaaslike Owerheidsopleiding

No. 41 van 1985

Nasionale koördinerende

opleidingskomitee

Representative/Verteenwoordiger

J A Loubser

REGIONAL TRAINING COMMITTEE 3.22 STREEKSOPLEIDINGSKOMITEE

J A Loubser —

D Briers —

E G Davies —

J D Dawson —

Transvaal

OFS/OVS

Natal

Cape/Kaapprovinsie



Representatives/Verteenwoordigers

J A Loubser  
F L U Daniel  
Dr N S Botha

AMEU SUB-COMMITTEE:  
REVISION OF PART G OF THE GUIDELINES  
FOR THE PROVISION OF ENGINEERING  
SERVICES IN RESIDENTIAL TOWNSHIPS

3.24 VME0 SUBKOMITEE:  
HERSIENING VAN DEEL G VAN DIE RIGLYNE  
VIR DIE VOORSIENING VAN  
INGENIEURSDIENSTE IN WOONGBIEDE

Representatives/Verteenwoordigers

J A Loubser — Convenor/Saamroeper  
J D Dawson  
A H L Fortmann  
K J Murphy  
J K von Ahlften  
C Beaurain  
A Gower  
Co-opted/Gekoöpteer  
V A Raynal  
J N Prak

REGIONAL SERVICES COUNCIL COMMITTEE

3.25 STREEKDIENTERAADKOMITEE

A J van den Berg

PRIVATISATION COMMITTEE

3.26 PRIVATISERINGSKOMITEE

F L U Daniel — Convenor/Saamroeper  
J G Malan  
G Nortje  
Ald/Rdh B Steyn  
Clr/Rdl F van der Velde  
Co-opted/Gekoöpteer  
P J Botes

WORKING GROUP: WIRING CODE  
SABS 0142

3.27 WERKSGROEP: BEDRADINGSKODE  
SABS 0142

J J Boshoff — Convenor/Saamroeper  
C E Adams  
J A Loubser

MEMBERSHIP

4. LIDMAATSKAP

The membership of the AMEU is presently as follows:

Die ledetal van die VME0 is tans soos volg saamgestel:

	1989	1987
Honorary Members/Erelede .....	33	36
Past Members/Voormalige lede .....	40	37
Engineer Members/Ingenieurslede .....	184	146
Associate Members/Assosiaatlede .....	35	39
Local Authorities/Plaaslike Besture .....	207	190
Affiliates/Geaffilieerdes .....	160	129
<b>Total Membership/Totale Lidmaatskap ..</b>	<b>659</b>	<b>577</b>

MEMBER MEETINGS

5. LEDE-BYEENKOMSTE

CONVENTION

5.1 KONVENSIE

The 50th Convention was held in Cape Town from 28th – 30th September 1987 and was attended by 727 delegates, guests and ladies.

Die 50e Konvensie het plaasgevind in Kaapstad van 28 tot 30 September 1987 en is deur 727 afgevaardigdes, gaste en dames bygewoon.

TECHNICAL MEETING

5.2 TEGNIËSE VERGADERING

The 12th Technical Meeting was held in Potchefstroom from the 5th to 6th September 1988 at the time of Potchefstroom's 150th Anniversary.

Die 12e Tegniëse Vergadering het plaasgevind in Potchefstroom van 5 tot 6 September 1988 tydens Potchefstroom se 150 jarige bestaan.

A record number of 413 delegates, guests and ladies attended this meeting.

'n Rekord getal van 413 afgevaardigdes, gaste en dames het die vergadering bygewoon.

The papers of both the Convention and the Technical Meeting, were printed in Proceedings which was posted to all members and delegates.

5.3 Die referate en besprekings van beide die Konvensie en die Tegniëse Vergadering is vervat in die gedrukte Verrigtinge wat aan al die lede en afgevaardigdes gepos is.

On behalf of the AMEU we wish to extend our sincere thanks and appreciation to all Affiliates who have sponsored advertisements for the Proceedings as well as various social functions.

5.4 Namens die VME0 wil ons graag 'n besondere woord van dank en waardering betuig teenoor die Geaffilieerde lede wat die advertensies van die Verrigtinge, asook verskeie sosiale funksies geborg het.

## STATUS OF CITY AND TOWN ELECTRICAL ENGINEER

The Provincial Administrations and Provincial Municipal Associations lend official recognition to the AMEU.

## CERTIFICATES OF MERIT

The Executive Council resolved to present certificates of merit to persons at Technical Meetings. These persons are elected on the ground of their meritoriousness and services rendered to the AMEU.

The following persons received the first certificates of merit at the 12th Technical Meeting held in Potchefstroom on 5th September 1988

J J Boshoff  
I L Hobbs  
Clr/Rdl Prof R Kriel  
Ald/Rdh B Steyn  
G Gerber  
N Kirschner  
T C Stoffberg

## UNITED MUNICIPAL EXECUTIVE

The following ad hoc committee was appointed to discuss matters related to the AMEU with the UME:

Messrs/Mnre A H L Fortmann  
F L U Daniel  
J A Loubser  
Clr/Rdl F van der Velde  
Ald/Rdh B Steyn

## INSTITUTE OF MUNICIPAL ENGINEERS SOUTH AFRICA

A special committee consisting of the President, President Elect and the immediate past President, presently Mr Loubser, was appointed to represent the AMEU in a liaison committee with IMESA.

The liaison committee, with special powers, must handle all aspects between the AMEU and IMESA.

The first matters discussed by the committee were the Draft Engineering Profession of South Africa Bill, as published in the Government Gazette No. 11067 d.d. 1987-12-18 and the possible formation of a trade union which can look after the interests of senior staff.

## CHANGE OF NAME

The Executive Council appointed Messrs. Loubser as convenor, Daniel and Von Ahlften as an ad hoc committee to investigate the whole matter of a change in name.

Mr A P Burger, honorary member of the AMEU, recommended that the word "Institute" be incorporated in the name.

The views of our members were invited but we did not receive much response. The matter is still under consideration.

## EDUCATIONAL INSTITUTIONS

The AMEU paid out a total amount of R40 400 over the two financial years for the advancement of education:

University Scholarship/Universiteitsbeurse .....	28 000
Municipal Training Centres/Munisipale Opleidingsentrums .....	5 500
Technikons .....	3 100
Technical Colleges/Tegniese Kolleges .....	3 300
University Merit Award/Universiteits Merietoekening .....	500
	<hr/>
	R40 400

## 6. STATUS VAN DIE ELEKTROTEGNIËSE STADSIENIGER

Die Provinsiale Administrasies en Provinsiale Munisipale Verenigings verleen amptelike erkenning aan die VME0.

## 7. MERIETE SERTIFIKATE

Die Uitvoerende Raad het besluit om sertifikate van verdienste aan persone aan te bied by Tegniese Vergaderings. Die persone word gekies op grond van verdienstelikheid en vir dienste gelewer aan die VME0.

Die volgende persone het die eerste meriete sertifikate ontvang tydens die 12e Tegniese Vergadering gehou te Potchefstroom op 5 September 1988

— Vanderbijlpark  
— Uitenhage  
— Bloemfontein  
— Boksburg  
— Affiliate  
— Affiliate  
— Eskom

## 8. VERENIGDE MUNISIPALE BESTUUR

Die volgende ad hoc komitee is saamgestel om sake rakende die VME0 met die VMB te bespreek:

## 9. INSTITUUT VAN MUNISIPALE INGENIEURS SUID-AFRIKA

'n Spesiale komitee, bestaande uit die President, die Aangewese President en die onmiddellike voormalige President, tans mnr Loubser, is benoem om die VME0 te verteenwoordig in 'n skakelkomitee met IMISA.

Die skakelkomitee sal alle aspekte met spesiale bevoegdhede tussen die VME0 en IMISA behartig.

Die eerste aangeleentheid wat die komitee bespreek het was die konsepwetsontwerp op die Ingenieursprofessie van Suid-Afrika soos gepubliseer in die Staatskoerant no. 11067 d.d. 1987-12-18 en die moontlike stigting van 'n vakvereniging wat senior personeel se belange kan behartig.

## 10. NAAMSVERANDERING

Die Uitvoerende Raad het 'n ad hoc komitee benoem bestaande uit mnr Loubser, saamroeper, Daniel en Von Ahlften, om die hele aangeleentheid van 'n naamsverandering te ondersoek.

Mnr A P Burger, ere lid van die VME0, het 'n aanbeveling gemaak dat die woord "Instituut" in die naam opgeneem behoort te word.

Die menings van ons lede is gevra, maar ons het nie veel reaksie ontvang nie. Die aangeleentheid is steeds onder bespreking.

## 11. OPVOEDKUNDIGE INRIGTINGS

Die VME0 het oor die twee finansiële jare 'n totale bedrag van R40 400 betaal aan die bevordering van onderwys:

University Scholarship/Universiteitsbeurse .....	28 000
Municipal Training Centres/Munisipale Opleidingsentrums .....	5 500
Technikons .....	3 100
Technical Colleges/Tegniese Kolleges .....	3 300
University Merit Award/Universiteits Merietoekening .....	500
	<hr/>
	R40 400

## CONCLUSION 12. AFSLUITEND

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. On behalf of all our 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 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.

We would like to extend our thanks to all organisations with whom the AMEU maintains close contact, for their goodwill and collaboration.

12.1 Hierdie verslag moet saamgelees word met die verskillende komitees en/of verteenwoordigers se verslae. Daar dien vermeld te word dat 'n aansienlike hoeveelheid tyd opgeoffer en heelwat werk deur die verteenwoordigers gelewer is. Die hulp wat aldus verleen word, is van onskatbare waarde vir die VME0 en sy lede. Namens die lede betuig ons ons dank vir daardie onbaatsugtige dienste.

12.2 Die Uitvoerende Raad het te alle tye getrag om die belange van sy lede na die beste van sy vermoë te dien.

12.3 Dit word met groot waardering gekonstateer dat ander Munisipale Institute die VME0 uitnooi om hulle kongresse by te woon. Daar bestaan dan ook 'n wederkerigheid tussen die VME0 en die ander Institute.

12.4 Graag bedank ons alle instansies met wie die VME0 'n noue verbintenis het, vir hulle goeie verstandhouding en samewerking.

## VOORGESTELDE WYSIGINGS TOT DIE GRONDWET

### 1. ONAFHANKLIKE STATE: LIDMAATSKAP

Dit word aanbeveel dat klousule 7.1 soos volg gewysig word:

Die lede van die Vereniging bestaan uit ondernemings, ander organisasies en natuurlike persone wat in Suid-Afrika of naburige onafhanklike state gevestig is of woon.

### 2. NAAM VAN DIE VERENIGING

Om die gewysigde klousule 7.1 te akkommodeer, word aanbeveel dat die naam van die Vereniging soos volg gedefinieer word in definisie 1.9 van die Grondwet:

"Die naam van die Vereniging" hierna genoem die Vereniging van Munisipale Elektrisiteitsondernemings (Suidelike Afrika)

### 3. Voeg 'n nuwe klousule by:

#### 24.6 SUB-TAKKE

Die Uitvoerende Raad kan goedkeuring verleen vir die stigting van 'n Sub-Tak op aanbeveling van 'n Tak. Die Sub-Tak doen regstreeks verslag aan die Tak en sal nie verteenwoordig word op die Uitvoerende Raad nie.

## PROPOSED AMENDMENTS TO THE CONSTITUTION

### INDEPENDENT STATES: MEMBERSHIP

It is recommended that clause 7.1 be amended as follows:

The membership of the Association shall consist of undertakings, other organisations and natural persons who are situated or resident in South Africa or independent neighbouring states.

### NAME OF THE ASSOCIATION

To accommodate the amended clause 7.1 it is recommended that the name of the Association be defined as follows in definition 1.9 of the Constitution:

"The name of the Association" hereinafter called the Association of Municipal Electricity Undertakings (Southern Africa)

Add a new clause:

#### 24.6 SUB-BRANCHES

The Executive Council may authorise the formation of a Sub-Branch on the recommendation of a Branch. A Sub-Branch shall report directly to the Branch and shall not be represented on the Executive Council.

## FINANSIËLE VERSLAG VIR DIE JARE 1987 EN 1988

deur Jan Loubser

Die Finanskomitee vir die tydperk 1987/1988 het bestaan uit:

Jan Loubser	—	Saamroeper plus raadslid
Alwin Fortmann		
Jules von Ahlften	—	Tegniese sekretaris
Bennie van der Walt	—	Sekretaris

Die Komitee het gereeld vergader en hul notules met aanbevelings is deur die Dagbestuur en Uitvoerende Raad noukeurig bestudeer. Jaarliks word 'n begroting opgestel wat deur die Uitvoerende Raad bekragtig word.

Die finansiële posisie van die VME0 oor die twee jaar word saamvattend hier weergegee:

	Jaar einde 1987	Jaar einde 1988
Inkomste: Konvensie/ Tegniese Vergaderings Min uitgawes	98 960	64 916
	50 979	22 836
	47 981	42 080
Plus dividende en rente	43 812	45 946
Ledegelde	59 700	63 900
Diverse	10 216	1 809
Bruto Inkomste	113 728	111 655
	161 709	153 735

Min Netto uitgawes				
Nuusbrief	14 235		22 229	
Beurse en Toekennings	18 250		21 650	
Administrasiekoste	72 580	105 065	91 962	135 841
Netto Surplus		56 644		17 894
Plus Opgehoopte Fondse		225 040		281 684
Beleggings		281 684		299 578
Plus Toegeedeelde Fondse		140 000		140 000
Totale Bates		R421 684		R439 578

Namens die VME0 wil ek graag my dank en waardering teenoor die komiteede vir hul insette betuig, asook ons ouditeure, Richardson, Reid en vennote, ons bankiers, Nedbank, Foxstraat, Johannesburg en al die plaaslike owerhede en hul rade wat die VME0 so getrou ondersteun het. Ons hartlike dank aan almal.

## REPORT ON PUBLICITY

In my report to the 1987 Convention I gave details of the work which was being done to publicize the AMEU by way of a Newsletter. At the time of writing this report issue No. 9 (June 1989) is being printed and will shortly be posted.

Judging from the positive feed-back and constructive criticism received from members after the first eight issues the Newsletter is filling the need for which it was intended. For its further success it is essential to have ongoing feed-back from all readers, for the continued support of our affiliates and in turn our response to their product news.

As previously reported, the question of production costs and the related matter of sponsorship rates has received ongoing attention and will continue to do so in an effort to keep the cost to the AMEU at reasonable levels. To date the average costs to the Association after allowing advertising income has amounted to R4 142 per issue.

The newsletter is posted to all Engineer Members, their Town Clerks, Treasurers, Civil Engineers, Town Secretaries, Librarians and Chairman of Management Committee, it goes to all Affiliate members and various University libraries and a number of other readers, approximately 1 800 in all.

I appeal to everyone to come forward with comments and suggestions.

A recent development affecting publicity for the industry as a whole, rather than AMEU activities, has also been receiving attention. This is a promotional campaign which will be attempting to make the public at large "think electric" and ultimately to "switch" to electricity as an energy source. The AMEU Executive is working closely with Eskom staff on the project, which is still in its formative stages.

Promotional material for TV, radio and papers will be prepared and financed by Eskom, who are also training staff to provide "back-up" for technical and general information. No reference will be made to Eskom or any supply authority during the campaign. All municipal supply engineers will be affected and preparations are being made to brief everyone on all aspects of the campaign.

Further information will be made available at the convention.

*M P P CLARKE  
Convenor*

## VERSLAG OOR PUBLISITEIT

In my verslag aan die 1987 Konvensie het ek besonderhede verskaf van wat gedoen is om die VME0 deur middel van die Nuusbrief te publiseer.

Met die skrywe van hierdie verslag word uitgawe no. 9 (Junie 1989) gedruk en behoort dit binnekort gepos te word.

Gesien in die lig van die positiewe terugvoering en opbouende kritiek vanaf lede, na die eerste agt uitgawes, kan dit aanvaar word dat die Nuusbrief sy beoogde doelwit bereik het.

Met die oog op die toekoms is hierdie terugvoering net so belangrik, asook die voortdurende ondersteuning van ons affiliasie en ons reaksie tot hulle produkte-nuus.

Soos voorheen gemeld is die kwessie van produksiekostes en wat daarmee saamgaan, die tariewe vir borgskap, voortdurend onder die soeklig om te verseker dat die VME0 se kostes redelik is.

Tot op datum beloop die gemiddelde koste R4 142 per uitgawe nadat die advertensie-inkomste van die produksiekoste afgetrek is.

Die Nuusbrief word aan alle Ingenieurslede, hulle Stadsklerke, Tesouriers, Siviële Ingenieurs, Stadsekreterisse, Biblioteekarisse en Voorsitters van Bestuurkomitees gestuur. Dit word ook aan alle Affiliaat-lede en verskillende Universiteitsbiblioteke en ander lesers gepos, ongeveer 1 800 altesaam.

'n Beroep word op almal gedoen om kommentaar te leer en met voorstelle vorendag te kom.

'n Onlangse ontwikkeling wat die publisiteit vir die nywerheid in geheel kan beïnvloed eerder as VME0-aktiwiteite, het aandag geniet. Dit is 'n promosieveldtog wat daarop gemik is om mense "elektries" te laat dink.

Die VME0 Uitvoerende Raad werk huidiglik saam met Eskom-personeel om die projek te loods.

Promosie-materiaal vir TV, radio en koerante sal deur Eskom voorberei en gefinansier word en Eskom is tans besig met opleiding van personeel vir tegniese en algemene ondersteunende doeleindes.

Geen verwysing na Eskom of enige verskaffer sal in die materiaal verskyn nie.

Allé munisipale elektrotegniese ingenieurs sal geraak word en voorbereidingswerk vind nou plaas om almal oor verskeie aspekte van die veldtog in te lig.

Meer inligting sal by die Konvensie beskikbaar wees.

*M P P CLARKE  
SAAMROEPER*

## RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES

The committee operates under the provision of the Code of Practice for the Wiring of Premises, SABS-0142, and makes recommendations to the Chief Inspector of Machinery on equipment which is intended for use in fixed wiring installations when no SABS specification exists for such equipment.

It comprises representatives of the following organizations:-

AMEU (Chairman, Vice Chairman and Secretariate)

Department of Manpower

S A Bureau of Standards

S A Posts and Telecommunications

S A Institute of Electrical Engineers

S A Association of Consulting Engineers

Eskom

Johannesburg Electricity Department

Electrical Contractors Association

Electrical Engineering and Allied Industries Association

Quarterly meetings are held and for the period November 1987 - when the previous report was submitted - until June 1989, a total of six meetings have taken place. Applications considered were 25 and of these 6 were recommended for authorization, 11 items were referred back for SABS tests or for more information or samples, and 8 fell outside the scope of the committees in terms of reference.

Arising from the committee work, the Chief Inspector agreed to extend the period of validity of authorization certificates from the previous 3 years, to 5 years. Also, in order to speed up authorization procedures, the Code of Practice has been amended and now makes provision for a sub-committee of 3 who advise the SABS on what tests should be carried out on any particular item under consideration, before the item is submitted to the committee for consideration. The subcommittee members are at present Messrs Clarke (AMEU), Crompton (Johannesburg Electricity Department) and Kneale (E.C.A.)

Sincere thanks are recorded on behalf of the AMEU to all committee members for their participation and contributions to the work.

*M P P CLARKE*  
Convenor



*Mr Max Clarke, Randburg*

## AANBEVELINGSKOMITEE VIR NUWE ELEKTRIESE WARE

Die komitee funksioneer in terme van die vereistes onder die Gebruikskode vir die bedrading van Persele, SABS-0142, en maak aanbevelings aan die Hoof Inspekteur van Masjinerie 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 verteenwoordigend op die Komitee:

VME0 (Voorsitter, Vice-Voorsitter en Sekretaris)

Departement van Mannekrag

S A Buro vir Standaard

Departement van Pos- en Telekommunikasiewese

S A Instituut van Elektrotegniese Ingenieurs

S A Vereniging van Raadgewende Ingenieurs

Eskom

Johannesburgse Elektrisiteitsdepartement

Elektrotegniese Aannemersvereniging

Vereniging van Elektrotegniese Ingenieurswese

en verwante Industrieë

Vergaderings word driemaandeliks gehou en vir die periode van November 1987 tot Junie 1989 met die voorlegging van die vorige verslag, het ses vergaderings plaasgevind.

Daar was 25 aansoeke vir oorweging waarvan 6 aanbeveel is vir magtiging, 11 items is terugverwys vir SABS-toets, vir meer inligting of vir monsters, en 8 het buite die gebied in terme van die opdrag aan die Komitee geval.

Voortspruitend uit die Komitees se werkverrigting het die Hoof Inspekteur ooreengekom om die geldigheid van magtigingsertifikaat se periode te verleng van die oorspronklike 3 na 5 jaar.

Om die prosedure vir magtiging te bespoedig, is die Gebruikskode ook gewysig en maak nou voorsiening vir 'n sub-komitee van 3 lede wat die SABS kan adviseer i.v.m. watter toets uitgevoer behoort te word op enige spesifieke item onder oorweging, voordat die item voorgelê word aan die Komitee vir goedkeuring.

Die sub-komitee se lede is tans Mnr Clarke (VME0), Crompton (Johannesburgse Elektrisiteitsdepartement) en Kneale (EA).

Die lede van die komitee word namens die VME0 hartlik bedank vir hulle deelname en bydraes tot die werksaamhede van die komitee.

*M P P CLARKE*  
Saamroeper

# VERSLAG OOR ELEKTRISITEITS- VOORSIENINGSKOMITEE

deur P J Botes

Die Elektriesiteitsvoorsieningskomitee is soos volg saamgestel:

Mnr P J Botes	Saamroeper
Dr N S Botha	
Mnrre M P P Clarke	
E G Davies	
F L U Daniel	
C E Adams	

As gevolg van dr Botha se aanstelling as Stadsklerk van Bloemfontein, is mnr D B Briers van Kroonstad in sy plek aangestel en na mnr Dennis Fraser se uitrede is mnr H R Whitehead gekoöpteer. As gevolg van heelwat werkverrigtinge en insette wat benodig was, is mnr C J Scherman van Pretoria genader om ook op die komitee te dien en sy bydraes word hoog waardeer. Mnr R Leigh van Johannesburg en mnr A J van der Merwe van Bloemfontein was ook uitgenooi maar kon weens omstandighede nie vergaderings bywoon nie. Mnr J Loubser en A Fortmann het by geleentheid ook insette gelewer. Mnr Clarke het as sekretaris van die eerste vergadering gehou op 6 November 1987 waargeneem waarna mnr J von Ahlfen, tegniese sekretaris, oorgeneem het. My dank aan hierdie twee laasgenoemde persone vir die diens gelewer asook aan al die komiteede vir hulle samewerking die afgelope twee jaar.

Die afgelope twee jaar was gekenmerk deur heelwat werkverrigting, veral op die gebied van kragbemarking en insette met betrekking tot die moontlike privatisering van Eskom. Die volgende aspekte was oor die afgelope twee jaar aangeraak.

## 1. POWER MARKETING STRATEGY OF ESKOM

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 customer's needs, attitudes and perceptions. Eskom will develop their own professional marketing organisation. The aim is to develop tariffs and conditions of supply which will satisfy Eskom's revenue requirements and meet the customer's need for greater control over their electricity cost, make available a wide range of information through customer advisory services and information centres, as well as pro-actively liaison with municipal and other customer groups to promote and support the overall marketing strategy.

Promotion of this strategy was furthered by visits by Jaap van Deventer and Martin Opperman of Eskom and I to all the branches of the AMEU.

Eskom further offered to educate municipal employees to do power marketing and to this end, one session was held and others are planned during the course of this year.

Contact is to be maintained at three levels namely the AMEU Executive at national level, the branches at provincial level and individual local authorities at municipal level.

Work is in progress on a joint plan of action on marketing between the local authorities and the regions of Eskom.

## 2. PRE-PAYMENT METERS

(a) The Executive Council appointed the cities of Durban and Pretoria to serve on the Eskom "Measurement Committee" for testing of the meters and Mr Whitehead and I with Mr Scherman as alternative to be the AMEU's representatives on the subcommittee established by the Minister.

(b) At a meeting convened by the Secretary of the Electricity Control Board, it was decided to survey the needs of the Electrical Authorities, consumers and the manufacturers in respect of pre-payment meters.

(c) The results can be summarised as follows:-

- (i) The present conventional metering and accounting systems are economical and are working well while meter tampering and loss of revenue due to non-payment of accounts is small. Exceptions are certain black and coloured municipalities.
- (ii) Relatively few distributors (33%) intend replacing conventional kW.h meters with budget type meters for certain classes of customers. Of those that do, only two have opted for expensive meters (6 500) while 14 have opted for inexpensive meters (16 000).
- (iii) The majority of distributors (63%) indicated that they intended installing budget type meters in some of their newly reticulated areas (mostly sub-economic or less affluent areas). Quantities in the next 3 years are 10 300 expensive meters and 42 100 inexpensive meters.
- (iv) The vast majority of municipalities (84%) consider a fair price for a budget type meter to be up to R250. Nearly 50% would accept accuracies within 2% while only 22% insist on accuracies within 1%; the remainder would accept accuracies within 5%. 71% Indicated that they would prefer to retain their accounting systems in parallel with any budget type meters. Nearly 60% suggest that certain types of customers (mostly the less affluent) may prefer budget type meters, while 29% suspect that customers may reject budget meters on several grounds, mostly based on discrimination.

The conclusions drawn from these results are:

- (a) The major application for budget meters is in the presently un-electrified and less affluent areas.
- (b) A relatively inexpensive (up to say R250) and moderately accurate (within say 2% or even 5%) instrument is required.
- (c) Budget meters should either be optional or applied uniformly within given geographical areas to avoid them viewed as discriminating against certain classes (economic groups) of customers.
- (d) Eskom prepared a specification for a Budget Energy Controller and have issued an enquiry. Messrs Scherman and Whitehead will represent the AMEU on these viability studies.

## 3. DIE RESERWE TRANSFORMATORLYS

Die lys was bygewerk met slegs enkele veranderinge maar ek kan egter geen voordeel aan die beskikbaarheid van so 'n lys sien nie.

Die lys bevat geïnstalleerde transformators groter as 5MVA en sluit nie spesifiek spaar of reserwe transformators in nie. Ek beveel aan dat daar met so 'n lys weggedoen word.

## 4. LOW TENSION OVERHEAD LINES

Following on the interpretation given by the Director of Manpower at the AMEU Conference in 1987, the City of Durban mentioned a difference of opinion expressed from the local department of Manpower. It was eventually established that Durban complies with the provisions as laid down for the protection of overhead lines.

The important points are to have a planned maintenance and inspection programme for the entire distribution system, correction of defects as soon as possible after inspection and to do an in-depth investigation on a regular basis.

## 5. AMENDMENT OF ELECTRICITY ACT: CESSION OF POWER LINE SERVIDUTES

The judgement in the Appellate Division case of Durban City Council vs Woodhaven & others has serious implications where City Councils have taken cession of power line servitudes from Eskom. The judgement established conclusively that servitudes

# THE POWER TO BE MORE PRODUCTIVE

As we accelerate towards the complex demands of the twentyfirst century, South Africa has no greater need than to be more productive.

There is no doubt, that if the unbounded potential of our manpower is developed and applied to the dynamic momentum of South Africa's technological infrastructure, South Africa will become more productive and take its place among the leading nations of the world.

To supply South Africa with its electricity needs as efficiently as possible, Eskom is progressively applying the most advanced principles of business management and manpower development.

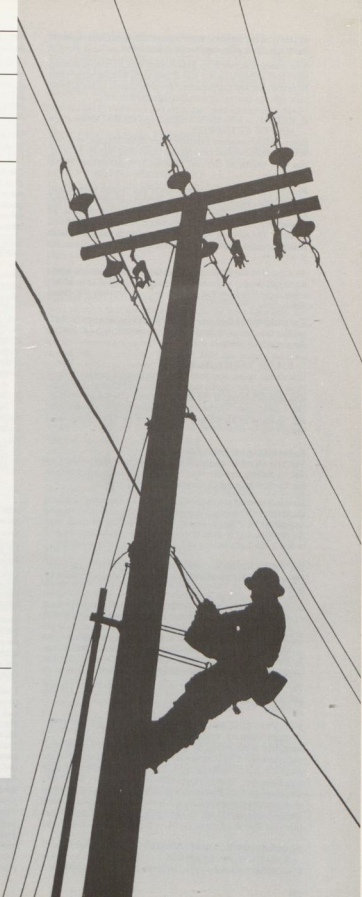
The cost-effective production of electricity is vital to power the present needs of the economy and to make it more productive in the future. Eskom's Chairman, Dr John Maree, succinctly stated the basic fact of the matter in his 1988 annual review:-

*"The biggest contribution that Eskom can make to South Africa's economy is to keep electricity costs down."*

This is the essential factor in Eskom's business vision.



**ESKOM**



of this type are personal in nature and the rights flowing there from are not legally capable of being ceded.

This matter was taken up with Eskom and a suitable amendment to the Electricity Act was drawn up by Eskom to the satisfaction of Durban Corporation. The amendment to the Act will now take its normal course through parliament.

#### 6. **ESKOM — kW-ASSESSMENT — OPERATING SUPPLY AUTHORITY**

Some AMEU members expressed their dissatisfaction with the, in their opinion unfair, benefits the Generating Supply Authorities were getting at the cost of other non-generating Supply Authorities.

Power stations are long term projects and cannot be terminated overnight. Eskom thus suddenly had unused electricity generation capacity available. The supply exceeded the demand. In financial terms the superfluity caused a poor return on capital invested. The solution would be to make better use of the available capacity, thus to sell more electricity, especially in the short term.

As a result of the situation a short term offer was made to the municipal supply authorities to rather buy part of their generation capability from Eskom with discount on their kW-rating component.

The exchange of free megawatts for generation gives municipalities the chance to modernise the power stations to further the national interest.

#### 7. **ESKOM TARIFF INCREASES**

Eskom has taken note that the municipalities require at least three months notice of a tariff increase, and I can assure members that this in fact is the aim of Eskom. There are, however, other constraints. The new tariff increase from 1 January 1990 will no doubt be known at the time when the Convention takes place.

#### 8. **NASIONALE ENERGIE RAAD**

Versekeie betrokke staatsrade wat oor selfopwekking beskik en wat 'n heffing aan die Nasionale Energie Raad moet betaal, het kommentaar op die konsepwetgewing gelewer.

Kennis is geneem dat die heffing spesifiek aangewend word vir die finansiering van ondersoek en navorsing na die prosesse van energieverkryging, -bestuur en -aanwending ten einde hierdie prosesse op die mees doeltreffende en ekonomiese wyse te orden in die beste belang van die verbruiker en gemeenskap.

Die VMEO het die volgende toepaslike projekte in die energiewerwante sfeer aan die Nasionale Energie Raad op aanvraag gestuur:

1. The influence of system overvoltages on cable insulation on account of fault conditions in underground distribution systems.
2. The influence of harmonics, generated by equipment, on high-voltage system isolation and in electrical installations.
3. Practical and environmental problems involved in the disposal of mercury vapour and sodium lamps.

The branches of the AMEU were also requested to suggest projects for the NEC.

#### 9. **INVESTIGATION INTO THE STRUCTURE OF THE ELECTRICAL INDUSTRY IN RSA**

Members of the Privatization Subcommittee and the major cities attended a Working Session on the strategic analysis of the electricity supply industry in the RSA conducted by Messrs Jaap van Deventer, Martin Opperman of Eskom and Mr Frank Cauldwell of Cauldwell and Associates on 21 April 1988. This study was used in compiling a report to the Electricity Council on the investigation conducted by Eskom re the feasibility to privatize Eskom.

#### 10. **ONDERSOEK NA DIE MOONTLIKHEID OM ESKOM TE PRIVATISEER**

Die Staatspresident in sy openingsrede van die gesamentlike sit-

ting van die Parlement op Vrydag 5 Februarie 1988, het die volgende aangaande die privatisering van Eskom gesê.

"Die Regering het reeds in beginsel besluit om die nodige wetswysigings by die Parlement in te dien, wat Eskom, die Suid-Afrikaanse Vervoerdienste en Pos- en Telekommunikasiewese, in die geheel van na verdeling in toepaslike bedryfsinstansies, sal omskep in ondernemings wat ten doel het om wins te maak en belasting te betaal.

Gesien die suksesvolle herorganisasie wat met Eskom bereik is, sal die nodige ondersoek wat daarop gerig is om beursnotering te verkry, in hierdie geval eerig gedoen word.

Die welbekende standpunt van die Regering oor privatisering dien egter beklemtoon te word, naamlik dat die Regering nie sal privatiseer bloot ter wille van privatisering nie, maar deurgaans voorrang aan die breë landsbelang sal verleen. Terselfdertyd sal bevredigende reëlings vir die hantering van die belange van hierdie instansies se personeel gevind moet word."

Soos voorheen in die verslag gemeld, het die VMEO verskeie bydraes gemaak waaronder die Elektrisiteitsvoorsieningskomitee ook 'n verslag in die vorm van my persoonlike bydrae het, wat ek as lid van die Elektrisiteitsraad ingedien het. Bekommernis word oor die volgende aspekte uitgespreek:

1. Eskom behoort eerder opgedeel te word in Opwekkings- en Verspreidingsstreeke en die streeke elk in eie reg geprivatiseer word.
2. Die verbruikers het oor die jare tot die kapitaaluitleg van Eskom bygedra, veral die bydraes in die Kapitaalontwikkelingsfonds, sodat die bates dus Eskom toekom, en dat die inkomste uit die verkoop van aandele Eskom moet toeval en nie die Staat nie.
3. Dat dit nie in landsbelang is dat Eskom geprivatiseer moet word nie. Die huidige opset werk redelik goed in die praktyk.
4. Selfopwekking deur Staatsrade nadat Eskom geprivatiseer is, behoort nie deur Eskom teengestaan te word nie.

Eskom het 'n voorlopige verslag aan die Kabinet voorgelê en die Staat asook Eskom doen verdere ondersoek oor die aangeleentheid.

#### **MR P J BOTES: ROODEPOORT**

Now we come to the Eskom Operating Supply Authority kW Assessment.

Mr President, we had a discussion with Dr John Maree of Eskom, that is the Past President Mr Fortmann and myself, and I've asked Dr Maree to have somebody available at this meeting to exchange all the problems attached to this question of take overs and I wonder whether Mr Dave Krum of Eskom wants to expand on this matter.

Meneer die President, die volgende item is die Nasionale Energie Raad. U het van dr Neethling se uitnodiging vanoggend kennis geneem, naamlik dat die VMEO moet deelneem aan die werking van die Nasionale Energie Raad. Ek wil net noem dat hierdie aangeleentheid ook in 'n Wet opgeneem en goedgekeur is. Daar word gevra dat takke verdere aansoek indien.

I will just mention the question of the investigation into the structure of the Electricity Supply Industry in the RSA. Dan ook die ondersoek na die Privatisering van Eskom. Meneer die President, ek het onlangs 'n besoek gebring aan Amerika voordat ek die Wereld Krabbron Energie Konferensie bygewoon het. Daar het dit vir my duidelik geword dat as 'n onderneming baie monopolisties is, daar 'n sterk reguleerder daargestel word in die lande. Soos byvoorbeeld in die USA word daar 'n sterk reguleerder daargestel. In plekke soos byvoorbeeld Nieu Seeland waar die privatisering van elektrisiteitsvoorsiening gaan plaasvind, het ons 'n stelsel wat gedisintegreer is naamlik 'n distribusiestelsel, 'n transmissiestelsel en 'n opwekkingsowerheid en is daar feitlik geen reguleerder nodig nie. Hier in Suid-Afrika gaan Eskom moontlik privatiseer en waar hy bykans 97% van die krag in Suid-Afrika opwek, is hy feitlik 'n monopoliseerder en moet daar reguleerders ingestel word. Ek dink hoe meer van 'n monopolie hoe meer moet daar gereguleer word en ek



wonder of ons as VME0 nie miskien aandag aan hierdie saak moet gee soos dit hoort nie. Dit is al kommentaar wat ek daaroor het.

#### **BOKKIE BOSHOFF: VANDERBIJLPARK**

Volgens die reserwe transformatorlys is dit blykbaar 'n lys wat geïnstalleerde transformators bevat. Nou as sulks dink ek dien dit nie enige doel nie, maar ek dink tog as daar 'n lys kon bestaan van reserwe transformators, werklike spaar transformators, kan dit vir baie van ons van baie groot nut wees en ek wonder of ons nie miskien dit op daardie basis wel aan die gang kan kry of aan die gang kan hou nie.

#### **MNR P J BOTES: ROODEPOORT**

Meneer Boshoff, ek het baie probleme in die verband. U weet dat as 'n stadsraad 'n reserwe transformator aanhou, in sekere gevalle het hy 'n transformator wat in diens is en dan het hy 'n bystandtransformator wat daar staan wat net ingeval daardie transformator buite werking raak, onmiddellik ingeskakel word. Is dit nou 'n transformator wat beskikbaar is en wat uitgeruil kan word? Ek glo nie.

Die enigste transformator wat uitgeruil kan word, is 'n transformator wat êrens staan en niks doen nie en wat die Stadsraad bestel het vir ingeval die Stadsraad sekere probleme ondervind. Dit is dus 'n moeilike aspek om te besluit of 'n transformator beskikbaar is al dan nie. Ek dink die enigste manier wanneer iemand probleme ondervind, en hy nie voorsiening maak het vir sy eie bystandtransformators nie, is om dan miskien die VME0 of Eskom te nader en ek dink dan sal hy baie gou geholpe raak. Ek glo nie dat hierdie lys enige doel dien nie en dat die definisie van 'n bystandtransformator ietwat problematies is.

#### **BOKKIE BOSHOFF: VANDERBIJLPARK**

Ek verstaan die probleem, maar mnr Botes het nou net gesê dat ons die VME0 kan nader, maar wie in die VME0? As daar nie 'n lys is nie dan weet ons nie om te nader nie. Ek voel wat sinvol gaan wees is om ondernemings te vra om eerlik te wees waarmee hulle moontlik behulpsaam kan wees, met ander woorde, daardie transformator wat daar staan vir ingeval iets ingee en as niks ingee nie dan is dit wel beskikbaar in 'n nood-groot. As ons so 'n lys kon kry dan dink ek kan dit van baie groot waarde wees.

#### **MNR P J BOTES: ROODEPOORT**

Meneer die President dit is juis my probleem, 'n transformator is nie so maklik beskikbaar nie. Dit kos 'n klomp geld, daar is vervoerprobleme, daar is afstande aan verbonde, daar is baie sake wat gereël moet word. Ek weet nie of dit so maklik is nie, maar ek dink die Uitvoerende Raad van die VME0 kan genader word, en die Uitvoerende Raad van die VME0 en die volgende Voorster van die Elektrisiteitsvoorsieningskomitee kan hulle sterk daarmee bemoei om so 'n onderneming behulpsaam te wees indien daar 'n probleem is en daar kan ook met Eskom geskakel word.

Ek glo regtig dat daar nie enige nut is om so 'n lys daar te stel nie. Ek meen die skakeling behoort vanaf die ingenieur na die voorster van die Elektrisiteitsvoorsieningskomitee te wees en daardeur behoort die ingenieur geholpe te raak.

#### **MNR F L U DANIEL: PRESIDENT**

Mnr Botes, tot 'n sekere mate stem ek met u saam, maar ek wonder of die skakeling nie met die Nywerheid gedoen kan word nie, want daar is feitlik net 'n paar wat die transformators vervaardig in die grotes waarvan ons nou praat, en as daar met hulle geskakel word weet hulle presies wie sulke eenhede tot hul beskikking het. Ek gee dit net as 'n voorbeeld omdat ons baie bereik het met hierdie wyse van optrede in plaasstad waar daar probleme ontstaan het. U skakel met die Kaapse Nyweraar wat transformators vervaardig en hulle het kennis van wat daar wel beskikbaar is in die land. Ek sal voorstel aan mnr Bokkie Boshoff dat hy op dieselfde wyse voortgaan soos ons, in plaas daarvan dat die VME0 hom daarmee bemoei. Onlangs het Eskom dieselfde probleme ondervind, waar die Nywerheid geskakel is en 'n oplossing gevind is.

#### **MNR P J BOTES: ROODEPOORT**

Meneer die President ek dink die ander aspek is natuurlik die Eskom-elektrisiteitstarief-verhoging vanaf 1 Januarie 1990. Dit is nog nie goedgekeur deur die Kabinet nie aangesien ons net 'n maand gelede 'n verkiesing gehad en ek dink daar is nog nie uitsluiting daaroor gegee nie.

Meneer die President al wat ek in die verband kan sê is dat dit nie meer as 14% sal wees nie.

#### **MNR F L U DANIEL: PRESIDENT**

Kan ons vir Dave Krumm vra of hy vir ons verder sal inlig daaroor. Ek dink hy is by die bron van inligting.

#### **MNR P J BOTES: ROODEPOORT**

Ek glo nie hy sal ons verder daaroor kan inlig nie. Al wat ek u kan sê is dat dit nie meer as 14% sal wees nie. Dit hang af van wat die Kabinet besluit oor die aangeleentheid. Ek weet nie of ek nou vooruit praat nie, maar dit was die gedagte.

#### **MNR F L U DANIEL: PRESIDENT**

Kan ons aanneem dat ons op 14% kan beraam vir ons toekomstige tarief-verhogings?

#### **MNR P J BOTES: ROODEPOORT**

Dit hang af hoe die Kabinet daaroor voel.

You will recall Mr President, I mentioned last year at the Technical Meeting that the real increase should have been 12% for 1989 but the Electricity Council recommended 10% and it was accepted by the Cabinet. One of the conditions we said was that it may be necessary to add another 2% and that brings it more or less this year to 14%. So that is what the present position is, but the last say would be the Cabinet.

#### **MR DAVE KRUMM: ESKOM**

I think Piet is right, we have asked for 14% and we have had no more information back from the Cabinet from that point so all we can say to you on the price increase is, that we requested 14% and we must await the decision on Council level.

#### **MR F L U DANIEL: PRESIDENT**

Do you anticipate Cabinet going to accept 14%? Was it well received or did you have eyebrows lifted?

#### **MR DAVE KRUMM: ESKOM**

Mr President, all I can say is that I don't think we can live in an environment where we take now and pay later. I think we have to take the 14%. It is reasonable and below the inflation rate. If we keep it down we are just going to look forward to higher increases in the coming years.

#### **MR F L U DANIEL: PRESIDENT**

Yes I think the 10% of last year was incorrect in any case. It was well below inflation and only placed Eskom in an invidious position and this is the fact we have to face up to now. We would probably have been faced with a 12% increase now, had it been 12% last year. Inflation at the moment is running at 16%, there are probably others in the meeting who can give us more information about that, but I think 16% is the accepted inflation rate at the moment, so you are below inflation. Lets say we sympathise with you, we know exactly the situation you are in and you have got to make a profit otherwise you won't be able to privatize. If you want to go onto the stock exchange like Iscor then you must show some form of profit. Dave do you want to comment further on the statements made by Piet or to assist Piet in getting himself out of his 14%?

#### **MR DAVE KRUMM: ESKOM**

No I can't assist on that anymore, but I would like to comment on the sale of network aspect. As I understand the question, you want me to reply on why we changed our policy in that regard - Piet, is that correct?

Eskom changed its policy towards the sale of networks. Well it started a little while back when we became business focussed and we had to look at a whole series of questions what our business was doing and how it was performing.

One of the questions we looked at was the question of subsidy. Now I know this is a very hot issue amongst the supply industry and where this arises from, and I think all Municipalities

can agree that our current tariffing philosophy throughout the Country is such that the older networks are the ones that are viable and the newer networks really are subsidised for capital from the older networks. In selling our networks at bookvalue the only time they were bought by the Municipalities was when they became viable as an operating entity of their own. What happened was, Eskom was losing a viable profit base, and what was happening was that our existing customers, our remaining customers, then had to pay high charges to carry that loss of income. And really we were prejudicing our own customers to the benefit of a small group of others, and what we did was to sit down and look at the whole way we approached the system and try and come up with a fairer mechanism that didn't only prejudice our customers, but didn't try and penalise the buyer of the equipment too much.

We came up with what we called "An economic value of the network", and really we looked at our earnings over the life of the network, discounted at what we assumed or take to be a realistic return on the investment of capital. We have moved away from a depreciated base of selling our networks to one of an economic base. I know it poses quite a penalty or a higher purchase price to the Municipalities but then again on the other hand it doesn't penalise our remaining customers, and we feel it is quite a fair approach.

#### **MR JAN LOUBSER: BENONI**

Meneer die President, wat ek so pas weer gehoor het, bevestig net weer dat ons as Munisipale Ingenieurs bekommerd moet wees.

In die verlede het Eskom hierdie netwerke aan ons verkoop teen die uitstaande balans van die lening. U moet onthou Eskom se tariewe maak voorsiening daarvoor dat hulle netwerke kan terugbetaal volgens hulle tariewe. Met ander woorde as hulle ons nou op 'n ander manier aanslaan, dan gaan Eskom meer profyt uit ons uit maak. Ek dink nie dit is regverdig nie. Die ou basis van uitstaande lening is billik. En as die uitstaande lening hoog is, dan betaal jy 'n hoër bedrag vir daardie netwerk, want hy is nog nie betaal nie. Maar as die uitstaande lening nul is, dan het daardie verbruikers van daardie elektrisiteitskema klaar vir hom betaal. Hoekom moet ons nou weer daarvoor betaal?

#### **MR DAVE KRUMM: ESKOM**

In our history we've not had a municipality buy a new network from us, and I think all of you around here will agree to that. They only buy them when they become viable and I think the second comment — can I ask if a Municipality would sell back a network to us that they have had in operation for 20 years and give it to us for the bookvalue? If they looked at their accounts and looked at how their capital depreciated they would not do that.

#### **MR F L U DANIEL: PRESIDENT**

To support Dave, the way that Eskom sell their assets is exactly the way Cape Town City Council sell their assets. We take it at today's value and depreciate it over 3% per annum and sell it at that value. I think that is a fair way of doing it and I don't think purchasing the asset is being at all prejudiced by doing it in that manner. Most of the networks you sell are invariably older than 20 years or some of them 33 years old, so they are basically given away at today's value.

#### **MR DAG GARDINER: AFFILIATE**

This is a very interesting discussion, but I would like to go back to the history of Eskom, which goes back quite a long time. Max Clarke over there will know about it. In the border region, Eskom bought the East London power station on the same basis of the outstanding loan monies. They bought the King William's Town power station plus its reticulation system on the same system and they bought the Alice power station and reticulation on the same system, on the outstanding loan accounts. So I don't understand this change of policy.

#### **MR F L U DANIEL: PRESIDENT**

Mr Gardiner, I think the change in policy is quite easy to understand. Eskom is now business orientated and they are out to recover costs and this is as simple as that, whereas before I think we were all in local authority vein transferring between

local authority and local authority and Eskom we also viewed as a local authority and we transferred or bought from Eskom in the same vein. That philosophy is now part of the past and we are going to have to view ourselves strictly on businesslike lines and recover costs and operate on businesslike lines.

#### **MNR CHRIS VOSLOO: RAAD VAN PLAASLIKE BESTUURSAANGELENTHED**

Meneer die President, my Raad is betrokke om gemeenskappe te probeer lei na selfstandigheid. Nou gebeur dit partykeer dat ontwikkelaars gebiede ontwikkel waar Eskom tradisioneel die voorsieningsowerheid is. Eskom wil dit dan oorneem by die ontwikkelaar teen geen koste nie. As ons kort daarna probeer om hierdie gebied by hulle oor te neem, om dit aan 'n onafhanklike plaaslike owerheid oor te gee, waar die eienaars van daardie grond reeds betaal het vir die netwerk, want daardie netwerk is ontwikkel teen die koste van die grond, en Eskom het dit oorneem teen geen koste nie.

Nou die oomblik as daardie plaaslike owerheid dit probeer oorneem van Eskom dan moet hulle dit oorneem teen die klandisie-waarde daarvan en dit dink ek is 'n bietjie vergesog.

#### **MR TREVOR GAUNT: AFFILIATE**

The question we seem to be debating is one of policy and it relates to more than just the sale of the asset. Eskom has enumerated a policy by which it would like to sell its assets. It also has a policy regarding the sales of electricity. It surprises me that the AMEU does not appear to have an equivalent policy, relating to the purchase of assets for what AMEU expects as an acceptable price increase, or various other policies which seem to come up under this report. And I would just ask whether the AMEU accepting that it is very difficult under its structure to enumerate a policy, should not be addressing this aspect. That it would take a policy approach rather than an individual negotiation or a response to somebody else's policy in each case.

#### **MR F L U DANIEL: PRESIDENT**

Trevor that is exactly what I was proposing now, that this matter be further discussed, possibly at the end of the reports or if you want to discuss it further in open session here or otherwise refer it to the Executive Council and the Electricity Supply Committee of the AMEU to take further steps in this regard and report back further. This is what my solution would be.

#### **MR JAN FOURIE: EVANDER**

Ek wil net graag by Eskom hoor wat is hulle houding omtrent die nuwe tarief wat hulle besig is om uit te werk om na-diverse tarief besparing uit te kanselleer.

#### **MR F L U DANIEL: PRESIDENT**

Kan ons dit nie oorhou tot na hierdie bespreking nie, want ek dink nie dit het betrekking op mnr Botes se verslag as sulks nie, of het jy 'n antwoord nodig in hierdie stadium?

#### **MNR JAN FOURIE: EVANDER**

Meneer die President, ja dit het eintlik daarmee te doen, want dit is 'n deel van Eskom wat 'n mens wil oorneem, as jy na-diversiteit besparing kan bewerkstellig om aan daardie verbruiker 'n goedkoper tarief te gee. En nou is hulle besig om 'n nuwe tarief uit te werk wat daardie diversiteit gaan uitskakel, en ek wil net weet wat sê Eskom daarvan en of hulle bewus is daarvan, of nie?

#### **MNR F L U DANIEL: PRESIDENT**

Ek dink nie dit is 'n besprekingspunt wat ons nou kan aanhaal op die verslag van mnr Botes nie. Ons moet dit op 'n ander geleentheid aanhaal. Mnr Botes het jy iets daarop te sê.

#### **MNR P J BOTES: ROODEPOORT**

Meneer die President, ek dink die posisie is dat Eskom besig is met nuwe tariefstelsels, wat hulle besig is om uit te werk, maar ek dink in hierdie stadium is dit nog nie van toepassing nie en is nog nie goedgekeur nie en ek dink ons moet maar wag tot daardie stelsels beskikbaar is. Dit is al inligting wat ek kan gee in hierdie verband.

#### **MR FRIKKIE KOTZE: PORT ELIZABETH**

I feel at this stage that we are talking at cross purposes and that we refer this matter to the Executive Council and all the members then can be notified afterwards.

**SABS-KOÖRDINERENDE KOMITEE**  
**VERSLAG**  
**SABS CO-ORDINATING**  
**COMMITTEE REPORT**

deur/by:  
**A.J. van den Berg**

**1. THE COMMITTEE**

The Committee consists of Messrs A J van den Berg (Convenor), J A Loubser and J E Heydenrych with Mr J K von Ahlften as Technical Secretary.

**2. ALGEMENE INLIGTING**

2.1 Verskeie vergaderings is gedurende die tydperk 1 Mei 1987 tot 30 April 1989 gehou, baie sake is telefonies afgehandel en sommige is na die Uitvoerende Raad verwys vir afhandeling.

2.2 Die SABS het 'n nuwe benadering tot komiteeverteenwoordiging en die VME0 is versoek om slegs een verteenwoordiger en een plaasvervanger te benoem.

2.3 Die SABS het meegedeel dat vanweë 'n algehele herorganisasie van sekere afdelings van die SABS alle projeknommers verander.

2.4 Die Afdeling van Elektriese Installasies, SABS 0142, is oorgeplaas na NETFA (Apollo) onder die bestuur van mnr J C van Alphen.

2.5 Mnr J E Toms is oorgeplaas as Sekretaris van die S A Nasionale Komitee van die IEK en die Elektriese Standaard Afdeling is na mnr A J Claassen as bestuurder oorgeplaas.

**3. REPRESENTATION**

3.1 Representatives of the AMEU have been nominated to work on the following new SABS Technical Committees:

- (a) 713/50580: Common Signalling for Use in Trunked Land Mobile Radio Systems.



Mnr Attie van den Berg

- (b) 713/59100: Committee for Electromagnetic Compatibility.  
(c) 754/50500: Energy Dispensing Controllers.  
(d) 791/50170: Distribution Transformers.  
(e) 791/50230: Compact Transformer Substations for Use in Public Areas.  
(f) 791/50240: Standard Longitudinal Mini-substations of Rating not exceeding 315 kVA Rev.  
(g) 15/14/14: General Power Cables Committee.  
(h) 764/50026: Impregnated Paper-insulated Electrical Cables.  
(i) 783/50390: Gloei-aansitters vir buisfluoresesierlampe.  
(j) 791-50160: Insulation, Co-ordination and Standard Voltages and Currents for Electrical Supply.  
This Committee was appointed as recommended by the SABS and the representatives are: C J Scherman, Pretoria, Convenor (see his report — item 4.9)

K C Dibb, Durban  
P A Leigh, Johannesburg  
C E Adams, Port Elizabeth  
F L U Daniel, Cape Town  
J A Loubser, Benoni  
E G Davies, Pietermaritzburg

- (k) 763/51210: Meterkabinette.  
(l) S A National Technical Committee 23J "Switch for Appliances".  
(m) 772/50170: Aardlekbeveiligingseenhede bo 30 mA.  
(n) 772/50180: Safety Specification for Contractors.  
(o) TC 20: All Cables.

**4. VORDERINGSVERSLAE: VME0-VERTEENWOORDIGERS**

4.1 Slegs vorderingsverslae van aktiewe komitees word hieronder gemeld onder die naam van die VME0-vertenwoordiger.

**4.2 Vertenwoordiger: Mnr J A Loubser**

**4.2.1 763/51010: Bedragskode (voortdurende hersiening)**

Die hersiening van SABS 0142 - 1981 is deur die Raad van die SABS op 3 Junie 1987 goedgekeur en die Tegniese Komitees WG 3 en WG 4 is dus verbind. In die plek daarvan is een enkele komitee saamgestel wat betrokke sal wees met die voortdurende hersiening van die Kode. Die VME0 se vertenwoordiger op hierdie komitee is mnr J A Loubser met mnr J K von Ahlften as alternatief. Verder is daar besluit dat die Kode elke vyf jaar as 'n hersiene uitgawe gepubliseer sal word. Voorstelle vir wysiging kan egter heeltyd aan die Raad van die SABS voorgelê word vir goedkeuring en sodanige wysigings, indien aanvaar, kan deur middel van afkondigings in die Staatskoerant byna onmiddellik van krag wees.

Etlke dosyne wysigings is reeds deur die komitee aanvaar, maar nie almal is dadelik afgekondig nie. Een van die belangrike wysigings wat reeds in Staatskoerant nr. 11125 van 5 Februarie 1988 nr. 141 afgekondig is, gaan oor die verpligte gebruik al dan nie van aardlekassierele's in die watervarmerstroombaan. Sub-seksie 6.3.3(d) is weggelaat.

Hoewel daar die afgelope twee jaar slegs een vergadering gehou is, naamlik op 14 Januarie 1988, is meeste van die wysigings deur middel van korrespondensie afgehandel en 'n ontsaglike hoop papierwerk was dus die gevolg daarvan.

Ten einde die vertenwoordiger op die komitee behulpsaam te wees, het die Uitvoerende Raad van die VME0 'n werkgroep saamgestel uit mnr Charles Adams, Jan Loubser en Bokkie Boshoff met laasgenoemde as samevoerder.

Navrae insake die Gebruikskode, dit wil sê vertolkings, kan nog steeds soos in die verlede direk aan die SABS gerig word, maar voorstelle vir wysigings moet asseblief aan die werkgroep gerig word.

Onlangs is kennis ontvang dat die Afdeling vir Elektriese Installasies oorgeplaas is na NETFA (Nasionale Elektriese Toets-fasiliteit: Apollo) onder bestuur van mnr J C van Alphen en ook dat mnr Van Alphen voortaan as voorsitter van die komitee sal optree.

Dit is egter heel van pas dat die dank van die komitee aan die vorige voorsitter, mnr J E Toms, oorgedra word vir 'n taak wel gedaan.

**4.2.2 763/51090: Verpligte Spesifikasie vir Kontakproppe, Kontaksokke en Verdeelproppe**  
Hierdie projek is voltooi en die spesifikasie is in Staatskoerant nr. 10866 van 21 Augustus 1987 afgekondig.

Kennisgewing van 'n voorgestelde wysiging is so onlangs soos 27 Junie 1989 ontvang. Die doel daarvan is om die spesifikasie in lyn te bring met SABS 164 - 1980 en TC 23.

**4.2.3 763/51050: Muur- en Toestelskakelears**  
Gedurende die afgelope twee jaar is slegs een wysiging aan die reeds bestaande spesifikasie aangebring en wel met betrekking tot die arbeidsfaktor waarteen die skakelears getoets moet word.

**4.2.4 772/50140/50150/50170: Verpligte Veiligheids-spesifikasies vir Aardlekbeveiligingseenhede**  
Slegs een vergadering is die afgelope twee jaar gehou, naamlik op 18 Mei 1989 en het hoofsaaklik gehandel oor die onbalansstroom wat vloei wanneer die toetsknoppie gedruk word.

**4.2.5 783/50420: Verpligte Spesifikasie vir die Veiligheid van Glimaansterters vir buisfluorescerlampe**  
Spesifikasie voltooi en beskikbaar as SABS 1479 - 1989.

**4.2.6 783/50370: Verkeersligte**  
Spesifikasie voltooi en beskikbaar as SABS 1459 - 1988.

#### 4.3 Verteenwoordiger: Mnr J D Algera

**4.3.1 722/50520: Ononderbreekbare Kragstelsels**  
Die projek is afgehandel en gedurende 1989 deur die Raad van die SABS goedgekeur.

#### 4.4 Verteenwoordiger: Mnr J J Boshoff

**4.4.1 Verwysingsnommer 15/11/5/5/1:**  
Projeknommer 851/51830

**Metaalleipe en -toebehore (met skroefent en met gladde ent) vir Elektriese Bedrading**

Deel 1: Metaalleipe — SABS 1065 - 1985 Deel 1.

Hierdie spesifikasie is op 27 Februarie 1985 goedgekeur waarna klein wysigings soos volg ter sprake was:

1. September 1985: Om 63 mm-pyp uit die spesifikasie te verwyder aangesien dit nie vervaardig of gebruik word nie.
2. November 1986: Om vir naatlose pype voorsiening te maak en om 'n wysiging aan die korrosietoets aan te bring.

Genoemde wysigings is in Junie 1987 goedgekeur.

'n Konsep-wysiging gedateer 21 Desember 1988 is ontvang wat voorsiening maak vir 'n ander lengte pyp.

Hoewel hierdie spesifikasie reeds goedgekeur is, is die komitee blykbaar nie ontbind nie.

**4.4.2 Verwysingsnommer 15/11/5/5/1:**  
Projeknommer 851/51840

**Metaalleipe en -toebehore (met skroefent en met gladde ent) vir Elektriese Bedrading**

Deel 2: Metaaltoebehore — SABS 1065 - 1986, Deel 2.

Die spesifikasie is gedurende Maart 1986 goedgekeur.

'n Wysiging aan die korrosietoets en ook om vir naatlose pype toe te laat, is in Junie 1987 goedgekeur.

**4.4.3 Verwysingsnommer 15/14/12/1:**  
Projeknommer 751/50010

#### Bedradingskode — Werkgroep 4

Die werkgroep is in 1987 ontbind en afgeskaf.

**4.4.4 Verwysingsnommer 15/14/67:**  
Projeknommer 763/51210

#### Meterkabinette

U het my op 7 Desember 1987 in kennis gestel dat ek op hierdie komitee aangestel is maar ek het nog geen korrespondensie in dié verband van die SABS ontvang nie.

**4.4.5 Werkgroep — Gebruikskode vir Bedrading van Persele**

Hierdie werkgroep wat na die tegniese vergadering in Potchefstroom geskep is, het weliswaar niks met SABS-tegniese komitees te doen nie, maar aangesien dit tog verwant is, gee ek graag die volgende terugvoering vir u inligting:

Ek het 'n stuk wat al die navrae en probleme rondom SABS 1064 waarvan ek bewus is, bevat, tesame met my voorstelle daarop, saamgestel en aan die ander twee lede, mnrre Jan Loubser en Charles Adams, gestuur. Weens die feit dat die lede so ver van mekaar verwyder is, moet alles deur middel van korrespondensie geskied en aanvanklik kom ons nie op dieselfde golflengte kom selfs oor wat die doel van die werkgroep is nie.

Ek en mnr Loubser het egter op 25 Mei 1989 bymekaar gekom en die aangeleentheid tesame met mnr Adams se kommentaar bespreek en hooplik sal die werkgroep nou koers kry en sal mnr Loubser binnekort die eerste voorleggings aan die bedradingskomitee kan doen.

#### 4.5 Representative: Mr A H L Fortmann

4.5.1

Kort Vorderingverslag Short Progress Report	Parts I, II, IV, V and VI have been completed and are available as published editions. Part I — 1986 Part II — 1987 Part III — 1987 Part IV — 1987 Part V — 1987 Part VI — 1987	The project Part III: Elastometers is outstanding and awaiting technical review. It is expected to be ready shortly.
Onderwerp Subject	Materials of electric cables and flexible cords	
SABS Ref No SABS Verw Nr	15/14/14/29	
SABS Proj	761/50560	

#### 4.6 Verteenwoordiger: Mnr C J Beaurain

##### 4.6.1 791/50230: Miniatuurstasies

Die kommentare wat op die eerste konsep-spesifikasie gelewer is, is blykbaar reeds grotendeels verwerk met die gevolg dat 'n aangepaste konsep binnekort verweg word.

#### 4.7 Verteenwoordiger: Mnr J D de Villiers

##### 4.7.1 SABS 1037 - 1985: Standaardtransformatordeurvoorders: Projek 791/50270

Slegs een konsep-wysiging van hierdie bestaande spesifikasie is oorweeg. Die effek van die voorgestelde wysiging is om deurvoorders wat, sover dit ontwerp, vorm en afmetings betref, identies of byna identies aan die spesifikasie is, vry te stel van toetsing opsigte van na kragfrekwensie-, droei-impuls- en temperatuurtygingtoetses aangesien hierdie eienskappe deur die genoemde ontwerp, vorm en afmetings bepaal word. Die voorgestelde wysiging is deur u verteenwoordiger ondersteun en is deur die Raad van die SABS aanvaar.

##### 4.7.2 Algemene Komitee insake Kragkabels

Hierdie komitee is gedurende 1988 hersaamgestel om na verskeie spesifikasies te kyk. Tot dusver is twee sake oorweeg:

##### 1. Dokument 1/88: Materiaal in Geïsoleerde Elektriese Kabels en Buigsame Koorde - Deel III Elastomere (Projek 764/50600)

Hierdie konsep-spesifikasie is vir kommentaar voorgelê. U verteenwoordigers het geen kommentaar gelewer nie aangesien geen sinvolle bydrae gemaak kon word nie.

##### 2. SABS 168 - 1978: Rubbergeïsoleerde Kabels en Buigsame Koorde (Projek 764/50040)

Slegs een konsep-wysiging van hierdie bestaande spesifikasie is oorweeg. Die effek van die voorgestelde wysiging is om vir Etilen Vinil aetaat gebaseerde rubberisolasië in die spesifikasie voorsiening te maak.

##### 4.7.3 SABS 1481 - 1989: Gemeenskaplike Seine vir Gebruik in Mobile Landradiostelsels met Dinamiese Frekwensiedeling (Projek 713/50580)

Hierdie spesifikasie is op die Britse Departement van Handel en Nywerheid se spesifikasie "MPT 1327 - 1988: A Signalling Standard for Trunked Private Land Mobile Radio Systems" gebaseer en is deur al die stappe insluitend goedkeuring van die Raad van die SABS gevoer.

Ten einde al die betrokke belangegroep te akkommodeer, is die volgende paragraaf in die inleiding tot die spesifikasie ingesluit:

"It is intended for use in public subscription trunked community repeater systems operating on a nationwide basis on more than one channel. It is also intended for use in other (eg private) systems where compatibility is an issue."

Gebruik van die spesifikasie is dus grootliks vrywillig. Dit dien ook gemeld te word dat verdere verbandhoudende dokumentasie deur (of namens) die telekommunikasie-owerheid opgestel sal moet word voordat hierdie spesifikasie werklik gebruik sal kan word (onder andere toekening van frekwensiebande en toetsmetodes).

##### 4.7.4 Subkomitee vir Elektromagnetiese Versoenbaarheid (Projek 712/16250)

Hierdie komitee is 'n subkomitee van die Frekwensie Spektrum Adviserende Komitee, wat op sy beurt 'n gesamentlike SABS-Poskantoor-komitee is. Tot dusver is nog net werkgroep saamgestel wat na die verskillende aspekte van die subkomitee se taak sal kyk, bv.:

- Gevoeligheid van verbruikerstoerusting by televisiestelle, telefone, persoonlike rekenars, ens. vir radio-uitsendings.
- Die toelaatbare perke van R F-uitstralings deur verbruikers-toerusting.
- Die toelaatbare perke van R F-uitstralings deur nywerheids-, besighheids-, mediese en wetenskaplike asook verspreidings-stelsels.

#### 4.8 Representative: Mr M Lee (replaced J H Davies)

##### Project 0781/5038: Electric Stoves, Cooking Tops and Project 0781/5014: Ovens, Grills

The only activity during the year was a proposal to permit a larger temperature rise on the surface of a stove than is presently permitted. This, however, was rejected.

#### 4.9 Verteenwoordiger: Mnr C J Scherman

##### SABS-komitee vir Standaardspannings-, -strome en -isolasiëpeile vir Elektrisiteitsvoorsiening (SABS 1019 - 1985) (Projek 791/50160, verwysing 15/14/64/1)

Op die 50ste VME0-konvensie wat in September 1987 in die Kaap gehou is, het 'n referaat onder die titel "Standaardspanning vir Laespanning-elektrisiteitsvoorsiening" gedien. Voortspruitend uit besprekings van die onderwerp het die Raad van die S A Buro vir Standaard "n komitee aangestel om die spesifikasie vir "Standaardspannings-, -strome en -isolasiëpeile vir Elektrisiteitsvoorsiening", SABS 1019 - 1985, te hersien.

Die volgende instansies, organisasies en belanghebbendes is genooi om in die komitee te dien:

- Die S A Buro vir Standaard
- Die Vereniging van Municipale Elektrisiteitsondernemings van Suid-Afrika (7 verteenwoordigers)
- Die Kamer van Wynwee
- Die Wetenskaplike en Nywerheidsnavorsingsraads Eskom
- Die Departement van Mannekrag
- The Domestic Appliance Manufacturer's Association of South Africa
- The Electrical Engineering and Allied Industries Association
- Die Hoogspannings- Koördinerende Komitee
- Die S A Vereniging van Raadgewende Ingenieurs
- Die S A Instituut van Elektriese Ingenieurs
- Die S A Vervoerdienste
- Merz & McLellan (South Africa)
- Pilkington Flat Glass (S A) Pty Ltd
- Cullinan Electrical Division Limited

Tydens die vergadering is verskeie standaardspannings oorweeg en is die perke van toelaatbare spanningsvariasies en aanvaarbare spanningstoleransies vir elektriese toestelle bespreek.

Na indringende bespreking van aspekte rondom die verandering van leweringspannings is 'n voorstel dat die standaard-IEK-spanning van 230/400 Volt as die standaardspanning vir laespanningkragvoorsiening in Suid-Afrika aanvaar word, deur 'n verteenwoordiger van die VME0 ingedien. Dié voorstel is feitlik eenparig deur die vergadering aanvaar.

Die vergadering het verder ook die volgende besluite geneem:

- Vir stelsels wat teen die standaardspanning (230/400 V) bedryf word, mag die spanning by die leweringspunt met nie meer as 6% van die standaardspanning afwyk vir enige periode langer as 10 agtereenvolgende minute nie. (Die leweringspanning is dus 230/400 V  $\pm$  6%).
- Leweringsnet wat laespanningsnetwerke bedryf teen spannings anders as die standaardspanning, moet hulle stelsels geleidelik aanpas sodat alle laespanningstelsels teen die jaar 2003 teen die standaardspanning van 230/400 V bedryf word.
- Vir stelsels wat intussen teen 'n spanning laer as die standaardspanning bedryf word (m.a.w. 220 V-stelsels) mag die spanning by die leweringspunt nie buite die perke van 230/400 V plus 6% en minus 10% wees nie.
- Vir stelsels wat intussen teen 'n hoër spanning as die standaardspanning bedryf word (m.a.w. 240 V- en 250 V-stelsels) mag die spanning by die leweringspunt nie buite die perke van 230/400 V plus 10% en minus 6% wees nie.
- Dat SABS 1019 hersien word om slegs vir die standaardspanning voorsiening te maak vir laespanningkragvoorsiening.
- Dat SABS 780 hersien word om voorsiening te maak vir 'n sekondêre nullaspanning van 420/242 V en 'n minus van 5% tap om bestaande 220/380 V-stelsels te akkommodeer totdat hulle uitfaseer word.

- (g) Dat bestaande wetgewing gewysig word om voorsiening te maak vir die nuwe standaardspanning.
- (h) Dat alle nuwe stelsels en diskrete dele van bestaande stelsels wat in diens gestel word, na die inwerkingtreed van die gewysigde wetgewing teen die nuwe standaardspanning bedryf word.

Die vergadering het ook 'n subkomitee aangewys om 'n konsep vir die wysiging van die Regulasies onder die Elektriesiteitswet op te stel.

Die konsepwysiging van die Regulasies is na die Elektriesiteitsbeheerraad verwys vir goedkeuring.

#### 4.10 Representative: Mr A J van den Berg

##### Fix Electric Storage Water Heaters: Project No 733/50110

- (a) At a meeting held on 31 August 1988 it was confirmed that SABS 151 makes allowance for a plug in storage heaters. The Wiring Code was amended to clarify this point.
- (b) It was also recommended that the definition for a fixed water heater should be changed to "A water heater that is permanently fixed in a specific location".
- (c) To accommodate plug-in geasers, it shall be fitted with a flexible cord complying with SABS 150 and a plug complying with SABS 164.
- (d) A suitable earth terminal to be provided.
- (e) The rating of the working unit shall not exceed 2 kW.
- (f) Water heaters with flexible cords would be limited to a capacity of 25 litres.
- (g) Identification of terminals:

Earth continuity terminal:

$\frac{1}{=}$

Negative, neutral or return terminal: N

Positive, phase or live terminal: L for single-phase and 1, 2 and 3 for three phases

#### MNR BOKKIE BOSHOFF: VANDERBIJLPARK

Met verwysing na Item 5.3: Elektriese Installasies van Geboue, merk ek hier op dat daar drie instansies is wat elkeen twee verteenwoordigers op die komitee het.

Ek verstaan dat die SABS se beleid deesdae is dat geen instansie meer as een verteenwoordiger op so 'n komitee moet hê nie. Die VME0 het een verteenwoordiger en ek sien drie instansies het elkeen twee verteenwoordigers. Dit lyk vir my nie baie logies nie, want ek dink as daar 'n instansie is wat werklik baie belang het by hierdie spesifieke komitee, dan is dit die VME0. Ek wonder net waarom het die VME0 nie ook twee verteenwoordigers as daar ander instansies is wat dit het nie.

#### E DE C PRETORIUS: ERELID

Mnr die President, ek wil my aansluit by die ander wat u reeds gelukgewens het met u Presidentskap. Mag u dienstyd gelukkig en vrugbaar wees.

Dan wil ek mnr Attie van den Berg van harte gelukwens met sy uitnemende SABS-verslag. Ek was eens op 'n tyd ook sameroeper van die betrokke komitee en is terdede bewus van die formaliteit om die besonderhede vir so 'n verslag te bekom en dit dan saam te vat. Ek moet hom ook komplimenter met die formaat waarin hy dit hierdie keer aanbied.

Ek wil my kommentaar toespits op die verslag van mnr Coen Scherman oor die voorgestelde standaardspanning vir laagspanningsnetwerke, te wete 230/400 V  $\pm$  6% - 10% aanvanklik (vir huidige 220/380-V-stelsels en  $\pm$  6% uiteindelik (vanaf die jaar 2003, dus oor 13/14 jaar).

Ek het al voorheen daarteen gewaarsku — en dit klink miskien eens 'n refrain: die oorsakelinge van 220/380 V  $\pm$  5% na die sg. standaardspanning gaan oneindig baie probleme oplewer met groot finansiële implikasies.

1. Huishoudelike (en ander) toestelle en motors wat ontwerp is vir 220/380 V en wat teen die jaar 2003 nog in algemene gebruik sal wees, se lewensduur gaan dramaties verkort word wanneer hulle blootgestel word aan spannings van 244/424 V, d.w.s. 230/400 V  $\pm$  6%. Hier is miljoene rande, miskien miljarde, ter sprake.



Mnr Eugene Pretorius, Oud-President en Erelid

- Op advies van die SABS het baie ondernemings 231/400-V transformators, veral die in minisubstasies, aangekoop sonder tappunte. Hierdie transformators sal almal vervang moet word teen astronomiese bedrae.
- Ek dink daar word getender vir probleme indien 'n 231/400-V-transformator met tappunte se sekondêre spanning opgestoot word na 242/420V weens oorversadiging van die kern. Is daar al veldtoets in hierdie verband gedoen?
- Volgens mnr Scherman is daar besluit "dat alle nuwe stelsels en diskrete dele van bestaande stelsels wat in diens gestel word na die inwerkingtreed van die gewysigde wetgewing teen die nuwe standaardspanning bedryf word".

Huisgesinne met 2220-V-toestelle wat in dieselfde dorp van 'n 220-V- na 'n 230-V-sonce trek — en dit sal heel algemeen voorkom — sal dus hulle toestelle moet vervang met toestelle geskik vir 230-V  $\pm$  6%. Dit kan politieke implikasies hê.

'n Vraag aan mnr Scherman: Is dit nie so dat heelparty eerste-wêreldlande wat tans 'n 220/380-V-stelsel bedryf nie geneë is om oor te skakel na 'n 230/400-V-stelsel nie?

Ek sluit af: Laat daar geboekstaaf word dat hierdie ou wtkop julle gewaarsku het teen 'n verkeerde stap.

#### MNR COEN SCHERMAN: PRETORIA

Ek kan besef dat daar by baie Munisipaliteite en baie Elektrotegniese Stadsingenieurs en sekerlik ook by Raadslede moontlik kommer kan ontstaan oor wat besluit is deur die komitee. Ek wil net graag daarop wys dat dit nie 'n komitee is wat net bestaan uit die VME0 nie, maar dat die Elektriesiteits-industrie omtrent regdeur daar verteenwoordig was. Daar was sewe lede van die VME0 wat op hierdie betrokke komitee gedien het.

Ek dink dit is sekerlik waar dat daar koste verbonde sal wees aan hierdie oorskakeling na 'n standaardspanning vir Suid-Afrika. Ek dink ook dat dit in landsbelang is, dat ons kyk na rasionalisering.

Die aanvaarding van 'n internasionale standaardspanning vir laagspanning verspreiding is iets wat oor die hele wêreld heen aandag geniet, en as Suid-Afrika in gedagte het om op die wêreldmark mee te ding, dan is dit vir ons noodsaaklik om kennis te neem van wat gebeur op die internasionale front en ons daarby aan te pas.

Die vereiste vir toerusting in Suid-Afrika verskil van Munisipaliteit tot Munisipaliteit. U is almal wees daarvan dat daar Munisipaliteite is wat ander spannings het as 220/380 Volt.

Dit is ook so dat daar Munisipaliteite is wat verklaar dat hulle spanning 220/380 V is, en as 'n mens dit gaan meet dan is dit nie heeltemal korrek om so 'n stelling te maak nie. Ons sal moet

aanpas, en ek dink dit is die belangrikste motivering wat geëien het by daardie komitee wat wêreldwyd aandag geniet en wat deur die IEK besluit is.

Die komitee het gevoel dat ons in lyn sal moet kom met wat die IEK besluit het. Ons beseft terdeë dat dit koste gaan verg, maar ek dink dit kos die eindverbruiker in Suid-Afrika indirek net soveel as wat dit ons gaan kos om te verander omdat ons daardie koste nie direk beskikbaar het nie.

Die verskil is net, dat om te verander gaan ons 'n eenmalige

uitgawe hê. Deur te bly by wat ons tans het, gaan 'n voortdurende uitgawe wees, en ek sou sê dat indien ons daarin kon slaag om te rasionaliseer en te standaardiseer, gaan ons industrie en ons verbruikers en ek dink ook al die Stadsrade en Munisipaliteite, en ook Eskom, net die voordeel daarvan pluk.

Dit is 'n moeilike stap, maar enige operasie is maar 'n pynlike proses en terwyl ons luister na wat mnr Pretorius sê, dink ek dit is net so belangrik dat ons ook 'n bietjie vooruit kyk en ons koers daarby aanpas.

## REPORT ON THE SA NATIONAL COMMITTEE OF THE IEC

## VERSLAG OOR DIE S A NASIONALE KOMITEE VAN DIE IEK

deur/by A J van den Berg

The International Electrotechnical Commission or more commonly referred to as the IEC is an international organisation with its primary role in international standardisation.

The IEC recognises member countries where each country has a national committee. Hence the South African National Committee of the IEC.

The national committee is the mouthpiece of that country's activities.

As the SABS is concerned with national standards, Dr Johnson of the SABS is, very aptly the present President of the S A National Committee of the IEC.

The AMEU has a right to automatic representation on the S A National Committee of the IEC and may also nominate members as Chairmen of Technical Committees in which the AMEU is represented.

Plenary sessions of the IEC take place annually.

The 1988 General Meeting was held in Istanbul, Turkey, where the AMEU did not have representation.

The 53rd IEC General Meeting is due to be held in Brighton, England from 3 to 15 July 1989 and I as President and Mr Attie v d Berg, are due to represent the AMEU as delegates of the AMEU.

At the time of compiling this report the 53rd IEC General Meeting is still to take place.

The IEC has the task of drawing up international electrical standard specifications which can be adopted or used as guidelines by national committees.

Numerous IEC technical committees exist. On one of these, TC20, Electric Cables, I have been appointed the AMEU representative.

In the above regard I wish to advise that the following IEC Publications have been issued by the Central Office of the International Electrotechnical Commission, Geneva, Switzerland:

Amendment No. 2 (1988) to Publication 245-4 (1980)  
Rubber insulated cables of rated voltage up to and including 450/750V.

Part 4: Cords and flexible cables.

Publication 702/1 — 1st Ed: Mineral insulated cables and their terminations with a rated voltage not exceeding 750V.  
Part 1: Cables.

Publication 287 (1982): Calculation of the continuous rating of cables (100% load factor)

Amendment No. 1.

Publication 885-3 — 1st Ed: Electrical test methods for electric cables.

Die Internasionale Elektrotegniese Kommissie, of soos meer algemeen na IEK verwys word, is 'n internasionale organisasie met sy primêre rol in internasionale standardisasie.

Die IEK erken ledelande waar elke land 'n nasionale komitee het. Gevolglik is dit hier die Suid-Afrikaanse Nasionale Komitee van die IEK.

Die nasionale komitee is die mondstuk van daardie land se aktiwiteite.

Omrede die SABS met nasionale standaarde betrokke is, is dit baie gepas dat Dr Johnson, die huidige President van die S A Nasionale Komitee van die IEK is.

Die VME0 het outomatiese reg om verteenwoordiging op die S A Nasionale Komitee van die IEK en mag ook lede vir Voor-sitters van Tegniese Komitees, waarin die VME0 verteenwoordig word, benoem.

Volle sittings van die IEK vind jaarliks plaas.

Die 1988 Algemene Vergadering was in Istanbul Turkye gehou, waar die VME0 nie verteenwoordig was nie.

Die 53ste IEK Jaarlikse Vergadering sal vanaf 3 tot 15 Julie 1989 in Brighton, Engeland gehou word, waar ek as President en mnr Attie v d Berg, as die VME0 se afgevaardigdes, die VME0 sal verteenwoordig.

Tydens die opstelling van hierdie verslag moet die 53ste IEK Algemene Vergadering nog plaasvind.

Die IEK se taak is om internasionale elektriese standaard spesifikasies op te stel, wat aangeneem, of as riglyne by nasionale komitees gebruik kan word.

Verskeie IEK tegniese komitees bestaan. Op een van hierdie, TK20, Elektriese Kabels, is ek aangestel om die VME0 te verteenwoordig.

Na aanleiding van bogenoemde wens ek u hiermee in te lig dat die volgende IEK publikasies deur die Sentrale Kantoer van die Internasionale Elektrotegniese Kommissie, Genève, Switzerland, uitgegee is:

Amendment No. 2 (1988) to Publication 245-4 (1980)  
Rubber insulated cables of rated voltage up to and including 450/750V.

Part 4: Cords and flexible cables.

Publication 702/1 — 1st Ed: Mineral insulated cables and their terminations with a rated voltage not exceeding 750V.  
Part 1: Cables.

Publication 287 (1982): Calculation of the continuous rating of cables (100% load factor)  
Amendment No.1.

Publication 885-3 — 1st Ed: Electrical test methods for electric cables.

Part 3: test methods for partial discharge measurements on lengths of extruded power cable.

To obtain copies of these Publications, orders should be placed with:

The South African Bureau of Standards  
Specification Sales  
Private Bag X191  
PRETORIA  
0001

OR

Ordered through one of the SABS's Regional offices in  
*Cape Town* — Tel No. (021) 6895511/7  
*Durban* — Tel No. (031) 289181  
*Port Elizabeth* — Tel No. (041) 337748

I would like to express my appreciation to the AMEU for the privilege I and Mr Attie v d Berg have been afforded to be able to attend the 53rd IEC General Meeting. I would also like to thank Dr Cliff Johnson, National President, for all he has already done and will do with the arrangements for the forthcoming General Meeting.

Part 3: test methods for partial discharge measurements on lengths of extruded power cable."

Om afskrifte van hierdie Publikasies te bekom, kan bestellings geplaas word by:

Die Suid-Afrikaanse Buro vir Standaarde  
Spesifikasie Verkope  
Privaatsak X191  
PRETORIA  
0001

OF

Deur een van die SABS se Streekkantore bestel word in  
*Kaapstad* — Tel no (021) 6895511/7  
*Durban* — Tel no (031) 289181  
*Port Elizabeth* — Tel no (041) 337748

Ek wil graag my dank en waardering teenoor die VMEQ uit-spreek vir die geleentheid wat hulle aan my en mnr Attie v d Berg gebied het om die 53ste IEK Algemene Vergadering by te woon. Ek wil ook Dr Cliff Johnson, Nasionale President be-dank vir al sy reelings wat hy reeds getref het en nog voor die naderende Algemene vergadering gaan doen.

## BYWONING VAN DIE 53STE ALGEMENE VERGADERING VAN DIE IEK IN BRIGHTON, ENGELAND, VAN 3 TOT 15 JULIE 1989

deur A J van den Berg

Die Uitvoerende Raad van die VMEQ het besluit om die Presi-dent van die VMEQ, mnr A H L Fortmann, asook myself, wat as Sameroeper van die Koördinerende SABS-komitees optree, af te vaardig om die bogenoemde vergadering by te woon.

Die Voorsitter van die S A Komitee van die IEK, dr C John-son, Direkteur, Elektroniese Ingenieurswese en Fisika, en die Sekretaris van die S A Komitee, mnr J E Toms, Afdelings-bestuurder, albei van die S A Buro vir Standaarde, het die ver-gadering as permanente lede bygewoon.

Mr Fortmann and I attended various Technical Committee meetings of interest and had the opportunity to discuss tech-nical problems with various members of the IEC from other coun-tries. We also attended the Action Committee Meeting and the Council Meeting where all delegates were present.

At social gatherings many friends were made and open discus-sions took place amongst members who all showed great in-terest to learn more about South Africa.

Ek wil namens die President, mnr Fortmann, wat as uitstaande ambassadeur vir Suid-Afrika uitglink het, en myself ons dank en waardering oordra aan die Uitvoerende Raad van die VMEQ wat dit vir ons moontlik gemaak het om die 53ste Algemene Vergadering van die IEK te kon bywoon.

The following article on "IEC in Brief" is to be read in con-junction with this report.

### ... IEC IN BRIEF

International trade needs standards and the International Elec-trotechnical Commission (IEC) provides world standards for the electrical and electronic industries. Designed to promote safety, compatibility, interchangeability, and acceptability, IEC standards benefit manufacturers, distributors and users of elec-trical and electronic goods and services, at all levels, world-wide. World standards are a form of international communication.

They are international agreements, written by experts with agreed-upon goals, using agreed-upon language and symbols. Standards make it possible for electrical and electronic equip-ment, systems, sub-systems and components to work together no matter where they are designed, manufactured, assembled or used.

Today, electrical and electronic goods make up more than 25% of international trade.

Rapid and accelerating development of the electronics sector had added greatly to both the need for and the complexity of the IEC's work.

Aware of the impact that electricity would make on all aspects of human activity, IEC founders in 1904 established a base to internationalize the electrical/electronics world as it was then, as we know it today, and as it will develop tomorrow.

Today, the IEC counts member National Committees in 40 countries. Together these countries represent more than 80% of the world's population and produce more than 95% of the world's electrical energy. They are: Argentina, Australia, Aus-tria, Belgium, Brazil, Bulgaria, Canada, China, Czechoslovakia, Denmark, Egypt, Finland, France, German Democratic Repub-lic, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea (Republic of), Korea (Democratic Republic of), Nether-lands, New Zealand, Norway, Pakistan, Poland, Portugal, South Africa, Spain, Sweden, Switzerland, Tunisia, Turkey, Union of Soviet Socialist Republics, United Kingdom, United States and Yugoslavia.

The IEC Central Office is in Geneva, Switzerland. Staffed by engineering specialists, technical translators and experienced, multilingual employees, the Central Office is equipped with the most up-to-date systems to assist the experts who actually pre-pare the standards. These experts work in a framework of Tech-nical Committees, Sub-Committees and Working Groups each dealing with a specialized aspect of electrical and electronic en-gineering. Official languages of the IEC are English, French and Russian.

IEC world standards are the basis for national standards in more than 100 countries and are also frequently used unchanged directly in international trade.

The IEC works closely with other organizations in the standard-ization field at national, international and regional level as well as with governmental and non-governmental organizations. Typical are the International Telecommunications Union (ITU) the International Labour Organization (ILO) the World Health Organization (WHO). Non-governmental organizations with which the IEC works include the International Union of Producers and Distributors of Electrical Energy (UNIPEDE)



## PROGRESS REPORTS ON IEC ACTIVITIES

### Representative: Mr C J Scherman

**TC 8: Standard Voltages, Current Ratings and Frequencies**  
IEC Publication 38 (1983) foresees only a revision of the standard in adopting the value 230/400 V at the supply terminals of public distribution three-phase systems, and presenting a programme for the evolution of present 220/400 V and 240/415 V systems towards the new voltage level.

No further action has taken place in the IEC.

### Representative: Mr C E Adams

**TC 14: Power Transformers**  
Documentation has been received from the Secretariat on the revision of publication 76-1, Power Transformers.

The Committee appears to be functioning well, but it is difficult for the AMEU to make a positive contribution, due to the highly specialised nature of the subject.

### Vertewoordiger: Mnr J A Loubser

#### TC 64: Elektriese Installasies van Geboue

Die werk van hierdie komitee gaan steeds voort met mnr J E Toms as Voorsitter van die S A Nasionale Komitee.

Die Komiteedele is die volgende:

Mnr J B J Haasbroek en R Henderson van Eskom  
Mnr D F Kneale en V A H McDonald van EKV  
Mnr V Cohen en K Nusse van Circuit Breaker Industries  
Mnr R Everatt van die S A Vereniging van Raadgewende Ingenieurs  
Mnr J W E Colhoun en I P Kruger van die SABS  
Mnr J A Loubser van die VMEQ

Daar is geen vergaderings van die S A Nasionale Komitee gehou nie, maar talloos dokumente is deur middel van korrespondensie afgehandel.

Die volgende publikasies het ook in dié tyd die lig gesien:

- Amendment No. 1 (1989) to publication 364-5-53 (1986): Electrical Installations of Buildings — Part 5: Selection and Erection of Electrical Equipment Chapter 53: Switchgear and Controlgear.
- Publication 364-7-704 — First Edition (1989-03) — Electrical Installations of Buildings, Part 7: Requirements for Special Installations or Locations — Section 70 — Construction and Demolition Site Installations.

## VERTEENWOORDIGING OP IEK-KOMITEES

Die volgende verteenwoordigers monitor gereed die werksaamhede van die komitees en het geen spesifieke kommentaar nie behalwe soos in 5.1 en 5.2 genoem.

TC 61B — Mnr C Crompton, Johannesburg  
TC 14 — Mnr C E Adams, Port Elizabeth  
TC 23, 59, 59A en 59H — Mnr P J Botes, Roodepoort  
TC 23E, 34, 34A tot D, TC 61, 61C en 61D — Mnr J K von Ahlfen, Springs  
TC 28 — Mr H R Whitehead, Durban  
TC 23B, 23C, 64 en 23J — Mnr J A Loubser, Benoni  
TC 20 — Mnr A H L Fortman, Boksburg  
TC 8 — Mnr C J Scherman, Pretoria

### Bywoning van die 53ste Algemene Vergadering van die IEK in Brighton, Engeland, van 3 tot 15 Julie 1989

Die Uitvoerende Raad van die VMEQ het besluit om die President van die VMEQ, mnr A H L Fortman, asook mnr A J van den Berg, wat as Sameroeper van die Koördinerende SABS-komitees optree, af te vaardig om die bogenoemde vergadering by te woon.

Die Voorsitter van die S A Komitee van die IEK, dr C Johnston, Direkteur, Elektroniese Ingenieurswese en Fisika, en die Sekretaris van die S A Komitee, mnr J E Toms, Afdelingsbestuurder, albei van die S A Buro vir Standaarde, het die vergadering as permanente lede bygewoon.

#### What is the IEC?

The IEC is an international, non-governmental organisation, with headquarters in Geneva, Switzerland. It is financed by the contributions of the National Committee in each of its 40 member countries.

#### What does the IEC do?

The IEC prepares and publishes international standards for the world's electrical and electronic industries.

#### Why IEC international standards?

IEC standards promote worldwide compatibility and safety of electrical and electronic equipment and components. They are a means towards achieving free trade in such goods between nations and economic regions.

Nations or regions applying IEC standards as their national or regional standards are working positively towards breaking down technical barriers to trade.

#### Who writes IEC standards?

IEC standards are written by Technical Committees and Working Groups made up of experts drawn from all the IEC member countries. At present there are some 200 Technical Committees and 700 Working Groups preparing standards. Their collective scope covers the entire field of electrotechnology.

In 1988 the IEC published well over 9 000 pages of new and revised international standards.

#### Who are members of IEC?

IEC members are the National Committees in the 40 IEC member countries. Each National Committee represents all the major electrical and electronic interests in its country.

These interests include manufacturers, testing laboratories, equipment and component vendors, buyers and users, consumer groups, government departments, public services, the engineering profession and research organisations.

IEC member countries comprise 80% of the world's population and consume 95% of the world's electrical energy.

Mr Fortmann and I attended various Technical Committee meetings of interest and had the opportunity to discuss technical problems with various members of the IEC from other countries. We also attended the Action Committee Meeting and the Council Meeting where all delegates were present.

At social gatherings many friends were made and open discussions took place amongst members who all showed great interest to learn more about South Africa.

Ek wil graag namens die President, mnr Fortmann, wat as uitstaande ambassadeur vir Suid-Afrika uitgeblyk het, en myself ons dank en waardering oordra aan die Uitvoerende Raad van die VMEQ en alle lede van die VMEQ wat dit vir ons moontlik gemaak het om die 53ste Algemene Vergadering van die IEK te kon bywoon. Ons dank gaan ook aan dr Johnston, leier van die afvaardiging en mnr J E Toms, albei van die SABS, vir hulle bystand en hulp met alle reëlins.

## REPORTS OF THE ELECTROLYTIC CORROSION COMMITTEES

### **Hoofkomiteevergadering, Witwatersrand:**

#### **Mr A J van den Berg**

Die 22ste Jaarvergadering van die S A Elektrolytiese Verweringskomitee het op Woensdag, 21 September 1988, om 10h00, by Eskom-sentrum, Cleveland, plaasgevind.

Die vier onderskeie streekkomitees se verslae is behandel en die enigste item waarby die VMEO betrokke is, is die volgende gebruikskode:

#### **Project 791/50310: The Application of Protective Multiple Earthing to Low-Voltage Distribution Systems**

##### **Progress**

Finalised and published as AMEU/SAIEE code of practice for the use of CNE on low-voltage distribution systems.

### **Cape Western Electrolytic Regional Field**

#### **Committee: Mr K J Murphy**

Six meetings of the Committee were held during the past two years. Attendance of the meetings varied from 70 to 80 percent, which can be regarded as most satisfactory.

Electrolytic corrosion in the Cape Western region appears to be well under control and only a few incidents of corrosion were reported. Important underground pipelines and structures are protected by well maintained cathodic protection systems and the S A Transport Services immediately respond to calls for assistance in cases of suspected possible electrolytic corrosion.

The Somerset West Municipality reported the severe corrosion of newly installed neutral earthing resistors of its 20 MVA 66/11 kV transformers. An investigation revealed that the steel tanks had been poorly zinc sprayed. The supplies removed and hot-dip galvanised the tanks and the corrosion has not re-appeared. Although a white coating is formed in the tank below the liquid level, this is regarded as a chemical deposit and not due to electrolytic corrosion.

Severe corrosion experienced at Voëlvei was found to be due to inferior materials and the Heideveld pipelines, previously reported, have now been replaced.

At Brackenfell sacrificial electrodes consisting of scrap steel poles were installed to reduce the high earthmat resistances experienced which had resulted in the severe corrosion of copper pipe water service connections.

Bad corrosion of a Post Office telephone cables lead sheathing at Eerste River was found by the CSIR and UCT to be due to galvanic soil action.

The minutes and reports of other regional field committees are studied at meetings with a great deal of interest.

Mr R R Gilmour has again taken over the chairmanship from Mr J de C Krynauw of SATS who has been transferred on promotion.

### **MR R R GILMOUR, CHAIRMAN: CAPE WESTERN ELECTROLYTIC CORROSION REGIONAL FIELD COMMITTEE**

As the AMEU representative on the Cape Western Committee Mr Murphy has covered adequately in his report the activities of that Committee during the period under review. However, as Chairman of this Cape Committee I attended the annual meeting of the Main Committee which on this occasion was held in the new premises of the Rand Water Board at Glen Vista, Johannesburg on 27 September 1989. The proceedings have been minuted and together with my annual report will be circulated

among all regional committees. I was able to report inter alia that stray current electrolysis is well under control in this region.

The Chairman of the Main Committee, Mr D A Smit, asked that the awareness campaign be revived and in this connection he suggested that I draw the attention of this Convention to the existence of the various corrosion committees and particularly to those engineers and others who are responsible for maintaining underground services or assets. In this regard attention is also drawn to my paper which I presented at the Technical Meeting held in Bloemfontein during 1984 and published in the relevant proceedings pages 41 - 53 and as Technical Bulletin No. 6 of the SAIEE with particular reference to section 2 thereof which deals with various organisations associated with corrosion control.

There are at present four regional committees namely,

Cape Western (which at present hosts to a certain extent the Eastern Cape)

Northern Cape

Natal

Witwatersrand and Orange Free State combined

Incidentally another important matter raised at this meeting is the cost associated with corrosion which will be included in the minutes of that Main Committee meeting. In this connection it is worth studying Mintek Report No. M251 dated 9 July 1986 published by the Council for Mineral Technology.

A number of SABS Codes of Practice are available which are relevant to problems associated with corrosion and its control as for example 021.

### **Northern Cape Electrolytic Regional Field**

#### **Committee: Mr D Briers**

The Committee continued to meet regularly to discuss such matters as might arise from time to time. During the period under review the Northern Cape was relatively inactive in respect of electrolytic corrosion matters.

The long-standing "Ramlogger" problem still drags on with very little hope of solution in the near future.

The only new bonds to be installed in the region were those at Mmabatho Airport Field Depot and the Balkfontein/Wolmaransstad pipeline. Both bonds seem to be functioning without any problems.

### **Natal Electrolytic Regional Field Committee:**

#### **Mr E G Davies**

This report covers the activities of the Natal Electrolytic Corrosion Field Committee for the two year period ending April 1989.

Four meetings of the Committee were held at which information on a variety of problems and latest developments was exchanged and discussed. The meetings were well attended and in general electrolysis in the Region is well under control with all involved parties co-operating to the full.

The S A Transport Services conducted extensive tests following a complaint of water pipe corrosion from a member of the public in Pietermaritzburg. The results of the tests were not conclusive but indicated that the problem was not necessarily related to the traction system but possibly to the electricity supply system and further investigations are being carried out.

The Committee received Technical Bulletin No. 8, "Guide regarding Electrolytic Corrosion" compiled by Mr C J van Rooy, retired from the S A Transport Services, and this informative document was copied to committee members.

The Committee was pleased to co-opt the services of Mr Van Rooy as a committee member and it looks forward to his valued contributions to the work of the Committee in future.

Member organisations were requested to submit details of all bonds affecting their services in the Natal Region in order that these bonds could be identified and registered.

The Committee has been successful in achieving its objectives during the period under review.

## ALGEMEEN

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.

Weens die ligging van die SABS se setel en die gevolglike

## REPORT OF TECHNICAL TRAINING COMMITTEE

by J.D. Dawson

### MR J D DAWSON: UITENHAGE

Just a couple of comments.

Item 2 — that is the report on the National Co-ordinating Committee — must be considered in conjunction with Mr Loubser's report on "The Local Authority Training Act" which I don't doubt he will expand upon later.

The AMEU Bursary Scheme is straightforward, except that the increasing costs of bursaries, means that the AMEU will have to change the format of these bursaries in order to attract good applications. And that I think is the basic point that must be remembered by the Technical Training Committee when they consider this particular item next year. It is very important that the people to whom they give bursaries shall be a credit to the AMEU.

In respect of the Merit Awards to Technikon and Technical Colleges, this is an extremely difficult problem and I think they will have to rethink this whole item in the coming 2 years.

I have nothing to add to item 5 — that is the Merit Awards to Universities — it seems to be working very well.

### 1. COMPOSITION OF COMMITTEE

As at the 30th June, 1989 the committee was composed of the following engineer members of the AMEU:-

J.D. Dawson	— Uitenhage (Convenor)
F.L.U. Daniel	— Cape Town
E.G. Davies	— Pietermaritzburg
A.H.L. Fortmann	— Boksburg
J.E. Hejdenrych	— Middelburg
J.A. Loubser	— Benoni
K.J. Murphy	— Somerset West
A.J. van der Merwe	— Bloemfontein

At the time of writing this report six meetings of the committee have been held since the AMEU Conference in Cape Town during September 1987 and a further meeting is scheduled to be held before the 1989 conference.

The meetings were also regularly attended by Mr. M.P.P. Clarke in his position as Publicity Officer and Mr. J.K. von Ahlfen the Technical Secretary.

### 2. NATIONAL CO-ORDINATING TRAINING COMMITTEE (NASKOK)

As a result of the AMEU decision to support the establishment

of an Apprenticeship Board for local authorities the AMEU was invited to provide three representatives on the Accreditation Committee of the new board. This committee will be responsible for the evaluation, auditing and monitoring of apprentice training and testing and this will include amongst many other responsibilities the preparation and publishing of standards for the specific requirements of training to cover such items as courses and programmes and the accreditation of training centres.

In order to give as wide a national coverage as possible Messrs. J.A. Loubser (Transvaal), H.R. Whitehead (Natal) and F.L.U. Daniel (Cape) have been appointed to represent the AMEU on the Accreditation Committee.

In addition to these official AMEU representatives the City Electrical Engineer of Bloemfontein, Mr. A. van der Merwe and Mr. C. Crompton of the Johannesburg Electricity Department are also members of this committee.



Mr John Dawson, Uitenhage

For some time the Technical Training Committee has been endeavouring to obtain AMEU representation on the main committee of the National Co-ordinating Training Committee. Eventually after much correspondence a meeting was arranged between Dr. Thornhill and Mr. Orr of Constitutional Development Services and President A.H.L. Fortmann and Mr. J.A. Loubser of the AMEU.

As a result of this meeting the AMEU has been invited to send

an observer to future meetings of the National Co-ordinating Training Committee and the observer will be Mr. J.A. Loubser. Although only a first step this invitation is important in recognising the status of the AMEU and that member undertakings of the AMEU do train a large number of apprentices each year.

### 3. AMEU BURSARY SCHEME

This scheme continues to function satisfactorily and the present recipients are Mr. Hubert Herbertstein and Mr. M.G. Majo both of the University of Cape Town.

The committee exercises strict control on the progress of the bursars and at the meeting held on the 15th June 1989 expressed satisfaction with the progress being achieved.

A large number of applications were received for the 1989 bursary but after careful study of these by the subcommittee appointed to approve the allocation of bursaries where members are the President and Mr. E.G. Davies of Pietermaritzburg it was decided not to award a bursary this year.

In order to keep pace with increasing costs the Executive Council approved an increase in the value of the bursaries to R7 500,00 as from the beginning of 1989 but it has become obvious that this amount will be inadequate to attract good applications in 1990.

With this in mind the committee is investigating a possible change in the format of the bursary conditions so that the amount granted will compensate for the actual costs incurred.

### 4. MERIT AWARDS TO TECHNIKONS AND TECHNICAL COLLEGES

Because of the large number of technikons and technical colleges which have been established in recent years it has become financially impossible for the AMEU to offer merit awards to all these institutions.

As a temporary measure the Executive Council decided to restrict the awards to those institutions which were already in receipt of awards prior to 1987 but this is obviously unfair and cannot continue indefinitely.

The committee had hoped that the authorities concerned would be able to identify the ten best students employed by member

undertakings of the AMEU attending technikons and technical colleges throughout the Republic.

However this does not appear to be possible mainly because these institutions do not all have the same examinations and the results therefore cannot easily be compared.

One last effort will be made in the coming year to establish what can be done in this direction but if this fails then it is the committee's intention to investigate some other method whereby the achievements of apprentices and learner technicians employed by member undertakings of the AMEU can be evaluated and recognised.

This could possibly take the form of an electrical Olympiad open to all such employees with a substantial award for the winner.

### 5. MERIT AWARDS AND UNIVERSITIES

Each year the South African Institute of Electrical Engineers organises a National Student Paper event open to final year electrical engineering students.

On the recommendation of the committee the Executive Council decided to award a R500 prize to the best paper on heavy current electrical engineering in the field of electricity supply at this event.

This year the event was held at Stellenbosch University and the best power-related paper was adjudged to be the one submitted by Gerard van Harmelen of the University of Pretoria on "Hardware development of a PC-based distortion measuring system in a three-phase power supply".

The actual award was presented to Mr. van Harmelen at the Highveld Branch meeting on the 14th April, 1989 and because this project is deemed to have been a great success the AMEU will continue to present this award in the future.

### 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 also to Mr. M.P.P. Clarke of Randburg who provided adequate publicity of all the committee's efforts and finally last but not least to Mr. J.K. von Ahlften who as Technical Secretary of the AMEU and secretary of this committee ensured that our deliberations were recorded and implemented.

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## AMEU TRAINING AWARDS

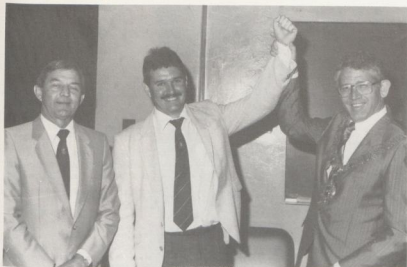
## VMEO OPLEIDING TOEKENNINGS

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The R250 prize donated by the AMEU to the most deserving apprentice at the Apprentice Training Centre during 1988 has been awarded to Mr C J Orton, a final year apprentice electrician who completed his N5 Certificate course at the Maitland Technical College and passed his trade test with a B symbol in September 1988.



*Mr Fred Daniel, President of the AMEU hands over the prize to Mr. Orton.*



Mnr Dave Naudé, Ingenieurstechnikus in die Stadsraad van Pretoria se Elektriesiteitsafdeling, kan daarvan getuig dat dit die moeite werd is om hard te studeer en konsensieus te wees.

Hy is onlangs met 'n kontantstjek van die Vereniging van Munisipale Elektriesiteitsondernemings van Suid-Afrika beloon omdat hy as die verdienstelikste 1988-student in die elektriese-meganiese rigting aan die Stadsraad van Pretoria se Vakopleidingsentrum aangewys is.

Mnr A.H.L. Fortmann, President van die VMEO, was by toe die tjek tydens 'n spesiale seremonie deur die Burgemeester van Pretoria, rhr dr E.S. Jacobson, aan mnr Naudé oorhandig is. Die funksie is ook deur verskeie Stadsraadslede en Afdelingshoofde, waaronder die Stadselektriesiteitsingenieur, mnr C.J. Scherman, bygewoon.

Mnr Naudé se onderskeie prestasies is soos volg: Hy het 'n Nasionale Tegnie Diploma behaal. Sy gemiddelde akademiese prestasie gedurende sy totale opleidings tydperk was 86% en sy klasbywoning was uitstekend. Sy toegewydheid ten opsigte van sy studies was ook puik. Hy is onder andere in 1985 aangewys as die beste student in die derde blok en in 1986 as die beste student in die tweede en derde blok. Hy het ook in 1987 die hoogste punte in die RSA behaal vir die vak Kragmasjiene: N6. Hy het in 1988 sy vaktoets te Olifantsfontein suksesvol afgelê.



Mnr C.J.F. Coetzee, Adjunk Stadsingenieur (Elektrotegnies), mnr Frigo Wouda, pryswenner, en mnr W. Boshoff, die opleidingsbeampte.

Die prys vir die mees verdienstelike vakleerling wat tans sy opleiding aan die Roodepoortse Opleidingsentrum ondergaan, word toegeken aan mnr F. Wouda. Mnr Wouda het sy vaktoets met 'n B-gemiddeld geslaag; hy het ook 'n N6-sertifikaat by die Krugersdorpse Technikon verwerf.



Tydens die prysuitdelingsfunksie wat op 18 Julie 1988 plaasgevind het, is die bedrag van R100 aan Robert Murray McGowan oorhandig.

Die toekening is gemaak vir die top student in die elektriese afdeling en is deur mevr. Fraser oorhandig.



*Student N G Skinner ontvang die VMEO toekening van mnr W H Uren, prinspaal van die Tegniëse Kollege, Uitenhage.*



*Die Westlake Tegniëse Kollege betuig hiermee graag sy dank en waardering vir u ruimskootse toekening vir die verdienstelike kwekeling in Elektrotegniëse Ingenieurswese.*

*Die foto toon kwekeling M M G Cha-Cha waar hy 'n prys in ontvangs neem by mnr R D Smith, Voorsitter van die Kollegeraad.*

**by/deur P J Botes**

Only one meeting was held over the past two years which was attended by Mr C. Adams on 27 November 1987.

A new priority list will have to be drawn up in 1990 but in the meantime the Regional Chairmen of Eskom will update the present list. A revised form B was discussed.

The following main objectives for 1988/89 were approved:

**1. MAIN OBJECTIVE**

1.1 To organise and control simulation exercises in the geographical area of each Eskom region, which will include at least every network as well as the primary preference consumers, so that the National Emergency Power Plan can be tested and the regional committee of SATEPSA which handles telecommunications, can be actively involved.

1.2 Refine the National Emergency Power Plan inside the geographical area of the twelve Eskom regions.

1.3 Confirm that each Primary Preference Consumer, regardless of the supply authority by whom he is supplied (Eskom/Municipalities), has drawn up his own emergency power plan according to which the power usage can be limited to the level assigned to him in emergency situations.

1.4 Ensure that possible power system operation problems, that will be detrimental to Primary Preference Consumers, be identified and that action be taken to rectify the matter.

Representatives: Messrs C Adams and P J Botes.

Daar is slegs een vergadering die afgelope twee jaar gehou, wat deur mnr C Adams op 27 November 1987 bygewoon is.

'n Nuwe Voorkeurlys sal in 1990 opgestel moet word. Intussen sal die bestaande lys deur die Streeksbestuurders van Eskom bygewerk word. 'n Hersiene B-vorm is bespreek.

Die volgende hoof doelwitte vir 1988/89 is toe goedgekeur:

**1. HOOF DOELWITTE**

1.1 Organiseer en beheer simulasioefeninge binne die geografiese gebied van elke Eskom streek wat ten minste elke netwerk sowel as die primêre voorkeurverbruikers sal insluit om sodoende die Nasionale Noodkragplan te toets en die streekskomitee van SATEKG wat telekommunikasie aangeleentheid hanteer aktief te betrek.

1.2 Verfyn die Nasionale Noodkragplanne binne die geografiese gebied van twaalf Eskom-streke.

1.3 Bevestig dat elke Primêre Voorkeurverbruiker, ongeag die voorsieningsliggaam deur wie hy voorsien word (Eskom/Municipaliteite), sy eie noodkragplan opgestel het waarvolgens die kragverbruik beperk kan word tot die vlak wat aan hom toegewys kan word gedurende noodsituasies.

1.4 Verseker dat moontlike kragstelselbedryfprobleme, wat Primêre Voorkeurverbruikers nadelig mag beïnvloed, geïdentifiseer word en dat aksie geneem word om die saak reg te stel.

Verteenwoordigers: Mnr C Adams en P J Botes.

**WORLD ENERGY CONFERENCE**

The 14th World Energy Conference is scheduled to take place in Montreal, Canada, from the 18th to 22nd September 1989. South Africa will be represented by some 12 delegates including Messrs Botes and Clarke from the AMEU Executive.

The S.A. National Committee meets twice a year to consider matters affecting energy resources in South Africa and inter alia has now published a National Energy Data Profile for the Republic for the years 1970 to 1987. Various members are actively involved in a variety of international working groups and are playing a positive role in world energy developments.

Perhaps the members would like to know that the recent World Energy Conference in Montreal debated at great length all aspects of energy, both electrical and other forms.

One of the matters that came out very strongly was the effect of energy or the use of energy on pollution in the atmosphere, and the next conference which will take place in three years time, is going to consider specific reports on what needs to be done to clean up the energy scene. There was a great deal of concern expressed about CO<sub>2</sub>, the greenhouse effect, acid rain and the NOX's, as they term it. There was a great deal discussed about alternative energy sources and one of the things that came through loud and clear, is that we will be required to reduce the amount of energy we use per capita. They have now coined the expression of "Negawatts" meaning negative watts. Try to save watts and in the process therefore, clean up the atmosphere.

The other matter that came forward very strongly was that the nuclear generation — the generation of electricity by nuclear power stations — will have to receive greater attention in the future. It happens to be one of the few pollution-free, or relative pollution-free sources of electrical generation. And although lots of environmentalists do not believe this, it is nevertheless a proven fact, that nuclear power is the power of the future and I am sure we are going to have more of that coming up in South Africa.

*M P P CLARKE*  
*Representative*

**WÊRELD ENERGIE KONFERENSIE**

Die 14de Wêreld Energie Konferensie sal in Montreal, Kanada plaasvind vanaf 15 tot 22 September 1989. Suid-Afrika sal deur sowat 12 afgewaardigdes verteenwoordig word insluitende Mnr Botes en Clarke van die VMEO Uitvoerende Raad.

Die S A Nasionale Komitee vergader twee keer per jaar en onder andere is 'n Nasionale Energie Data Profiel vir die tydperk 1970 tot 1987 nou deur dié Komitee gepubliseer. Verskeie lede is ook by verskillende internasionale werkgroepe betrokke en speel 'n belangrike rol in die wêreld se energie-ontwikkeling.

*M P P CLARKE*  
*Verteenwoordiger*

# REPORT ON THE ACTIVITIES OF THE AMEU/ILESA/SANCI STREET LIGHTING ADVISORY COMMITTEE AMEU CONVENTION

by A H L Fortmann

Die projek wat hier aan die gang is — die meeste van hulle is klaar — is projek No. 9 wat feitlik klaar is en ek dink die verslag is amper selfverduidelikend, maar ek wil net noem dat mnr Robbie Yates huidige oorsig is en dat hy verder inligting inwin oor projek 9.

Projek 9 sal 'n kort beskrywing wees van waaroor dit gaan. Die Lighting Code on Street Lighting will be revised and replaced by this Code, but projek 9 will actually make reference to that, and I wonder if Mr David Gilbert from Vector is here. He is the man that should be approached to see if he has copies available of the rest of these projects. They are useful, they are handy and I think all Municipal Electrical Engineers, not only the Engineers but staff in their Departments, Superintendents right down to Street Light Attendants, should in fact have them and could use these guidelines. So I would appeal to you to try and get hold of David Gilbert. I give his address in my report and I urge you to please contact David Gilbert for further information.

This report covers the activities of the AMEU/ILESA/SANCI Street Lighting Advisory Committee.

## HISTORICAL

On 29 February 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 the members of each of the three organisations were appointed to form the new "Street Lighting Advisory Committee". The present members are as follows:-

AMEU Messrs A H L Fortmann  
J E Heydenrych and  
J K von Ahlften

ILESA Messrs J Grundy and R Yates

SANCI Messrs A Claassen and  
M Martins

Although Mr von Ahlften is a retired member of the AMEU, this Committee considered it prudent to retain him in view of his association with this Committee from the outset and of course his deep knowledge of its activities.

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 resolved to revise the SABS Code On Street Lighting before compiling Project 9.

It is visualised that "Project 9: Design Parameters" will probably only contain a brief summary of the Code and reference to it.

The Committee considered a draft which was compiled and comments by the Committee Members were submitted early in 1989, before the issuing of the final draft.

The final draft has been sent out to all concerned, including the SABS, for comments.

It is proposed to hold a Workshop/Symposium later in 1989 or early in 1990 for the purpose of explaining the contents of the new Code, called the Code of Practice for Public Road Lighting.

The AMEU Executive Council has in principle agreed to the holding of such a Workshop or Symposium with the proviso that it is self-financing.

It is a great pity that AMEU members appear not to freely make use of these Guidelines, which are considered to be invaluable, to engineers, middle management, electricians and street lighting attendants in local authorities.

The Guidelines For The Installation And Maintenance of Street Lighting are published under the auspices of the journal "Vector" but at the present time only a few, if any, copies are still available from Vector. These are provided complete with suitable binders.

It is suggested that contact be made with Vector to establish if any copies are in stock.

For the benefit of AMEU members who do not receive "Vector", the following address is provided:-

"Vector"  
P O Box 311  
KLOOF  
3640

## VERSLAG OOR DIE BEDRYWIGHEDE VAN DIE VMEQ/IVISA/ SANKV STRAATBELIGTING ADVISERENDE KOMITEE

deur A H L Fortmann

Hierdie verslag dek die bedrywighede van die VMEQ/IVISA/  
SANKV Straatbeligting Adviserende komitee.

### GESKIEDKUNDIG

'n Simposium, getiteld "Practical and Economical Road Lighting" is op 28 Februarie 1978 in Johannesburg gehou. Dit is 'n gesamentlike projek van die VMEQ, 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 is twee lede van elk van die drie organisasies aangestel om die nuwe "Straatbeligting Adviserende Komitee" te vorm. Die huidige lede is soos volg:-

VMEQ Mnr A H L Fortmann,  
J E Heydenrych en  
J K von Ahlften

IVISA Mnr J Grundy en R Yates



Alhoewel mnr Von Ahlfen 'n afgetrede lid van die VME0 is, beskou hierdie Komitee dit as belangrik om hom as lid te behou synde sy betrokkeheid by die Komitee van die begin af en dan beslis sy diepliggende kennis van die komitee se aktiwiteite.

By die eerste vergadering het die komitee ooreengekom om riglyne oor alle benaderings in verband met straatbeligting 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: Ontwerpparameters
- Projek 10: Voertuie en Toerusting in Gebruik by Straatbeligting.

#### HUIDIGE STAND VAN SAKKE

Al die projekte, behalwe Projek 9, is voltooi.

"Projek 9: Ontwerpparameters". Die Komitee het besluit dat die SABS Gebruikskode Oor Straatbeligting eers gewysig word voordat Projek 9 opgestel word.

Dit word in die vooruitsig gestel dat "Projek 9: Ontwerp-

parameters" slegs 'n kort opsomming van die Kode en verwysing daarna sal insluit.

Die Komitee het 'n konsep wat opgestel is oorweeg en kommentaar is vroeg in 1989 deur die Komiteelede ingedien voordat die finale konsep uitgegee is.

Die finale werkstuk is aan alle betrokkenes en die SABS vir kommentaar uitgestuur.

Daar is voorgestel om 'n Werkswinkel/Simposium later in 1989 of vroeg in 1990 te hou, met die doel om die inhoud van die nuwe Kode, genoem die Gebruikskode vir Openbare Padbeligting, te verduidelik.

Die VME0 Uitvoerende Raad het in beginsel ingestem vir die hou van so 'n Werkswinkel of Simposium met die voorwaarde dat dit self-finansierend is.

Dit is 'n groot jammerte dat VME0-lede nie van die riglyne vrylik gebruik te maak nie, aangesien die riglyne waardevolle inligting bevat wat deur ingenieurs, middelbestuur, elektrisiëns en straatligbedieners van plaaslike owerhede gebruik kan word.

Die Riglyne Vir Die Installasie En Onderhoud Van Straatbeligting word deur die tydskrif "Vector" gepubliseer maar tans is slegs 'n paar, indien enige afskrifte van Vector beskikbaar. Hierdie afskrifte word volledig met gepaste binders voorsien.

Dit word voorgestel dat daar met Vector in verbinding getree word om vas te stel of daar enige afskrifte in voorraad is.

Vir dié VME0-lede wat nie "Vector" ontvang nie, word die volgende adres verskaf:-

"Vector"  
Posbus 311  
KLOOF  
3640

Verder het die volgende lede die verskillende Substreke verteenwoordig:-

Wes-Kaap:	F. Daniel van Kaapstad
Oos-Kaap:	C. Adams van Port Elizabeth
Noord-Transvaal:	J. van P. Lochner van Pietersburg
Oos-Transvaal:	J.E. Heydenrych van Middelburg
Wes-Transvaal:	G.F. Rautenbach van Klerksdorp

Volgens die jongste besluit van NASKOK sal die Institute en verenigings nie meer permanente lede hê op die Substreke nie maar nog steeds op die Streekkomitees. Die Substreke het eg-

## OPLEIDINGSRAAD WET OP PLAASLIKE OWERHEIDSOPLEIDING 1985 (WET 41 VAN 1985)

deur J A Loubser

In terme van bogenoemde wet is die Nasionale Koördinerende Opleidingskomitee (NASKOK) saamgestel. Die Instituut van Municipale Ingenieurs het van die begin af sitting op NASKOK gehad maar nie die VME0 nie. Na vele korrespondensie oor hierdie onderwerp het die President, mnr. Fortmann en mnr. Loubser uiteindelik daarin geslaag om deur middel van mnr. Johan van der Merwe van die MWO 'n onderhoud met dr. Thornhill en mnr. Orr van Staatkundige Ontwikkelingsdiens te bekom. Uit die onderhoud het dit weer eens geblyk dat die naam van die Instituut van die Siviele Ingenieurs n.l. "Die Instituut van Municipale Ingenieurs" nog steeds ons grootste probleem is omdat daar geglo is dat die Instituut alle Municipale Ingenieurs ook die Elektriese Ingenieurs insluit. Aan hierdie probleem sal die nuwe VME0/IMISA Skakelkomitee so gou moontlik aandag moet gee.

As gevolg van die onderhoud het die VME0 nou waarnemerstatus op NASKOK verkry en mnr. J.A. Loubser is afgevaardig om die vergaderings by te woon.

Intussen gaan die werk op Streek- en Substreekvlak steeds voort. Die huidige Streeksvertegenwoordigers is soos volg:-

Transvaal:	J.A. Loubser van Benoni
Kaapland:	K. Murphy van Somerset-Wes
Oranje-Vrystaat:	D. Briens van Kroonstad
Natal:	E.G. Davies van Pietermaritzburg



Mnr Jan Loubser, Benoni

ter die reg van koöptering en by 'n vergadering wat op 27 Junie 1989 van die Transvaalstreek plaasgevind het, het dit geblyk dat die meeste Substreke wel van die koöptering sal gebruik maak.

Heelwat kursusse waarvan die VMEO lede kan gebruik maak is reeds goedgekeur. As voorbeeld word net 'n paar genoem:-

Elektrisiekursus  
Straatligbedieners Gr. I en Gr. II  
Onderhoudswerker  
Opleidingsentra se kursusse by Departement van Mannekrag geregistreer  
Elektrisieshulp

Lede wat belangstel moet asseblief hulle Substreksverteenvoorders nader.

#### STIGTING EN BEDRYF VAN 'N VAKLEERLING-OPLEIDINGSRAAD VIR PLAASLIKE OWERHEDE

Op 27 Januarie 1989 het NASKOK die stigting en bedryf van 'n Vakleerlingopleidingsraad vir Plaaslike Owerhede goedgekeur. Die samestelling van die Opleidingsraad is die volgende:-

Raadslid Van Blerk van Johannesburg (Voorsitter)  
Raadslid Malan van Pretoria  
Raadslid Muir van Kaapstad  
Raadslid Venter van Durban  
Raadslid prof. du Plessis van Bloemfontein  
Raadslid Kriek van Benoni namens die Oos-Randse Plaaslike Owerhede wat die Oos-Randse Opleidingsentrum bedryf  
Raadslid P.A.M. Brink, S. van Eeden en C. Scholtz wat die MWO verteenwoordig  
mnr. A.J. van Schalkwyk MWO  
mnr V. Venter van Mannekrag

Hierdie Raad het alreeds 2 vergaderings gehad.

Die Akkrediteringskomitee is 'n permanente Subkomitee van die Raad en sluit die volgende lede in wat deur die Raad aangestel is:

Die Hoof Uitvoerende Beampte, mnr. Koos Venter van Johannesburg  
Twee lede van die MWO, mnr. A.J. van Schalkwyk en P.F. Colombo  
Drie lede van die V.M.E.O., mnr. J.A. Loubser, H.R. Whitehead en F.L.U. Daniel  
Een lid van die I.M.S.I., mnr. H. Botha  
Een lid van die I.M.P., mnr. M.J. Uys  
Een lid van die Evalueeringsraad van die Opleidingsraad, dr. L.J. Fick  
Een lid van die Pretoria Opleidingsentrum, mnr. W.J. Culber  
Een lid van die Bloemfontein Opleidingsentrum, mnr. A.J. van der Merwe  
Een lid van die Johannesburg Opleidingsentrum, mnr. C. Crompton  
Die Sekretaresse, mev. H. Norris van Johannesburg

Alhoewel daar aanvanklik net 3 lede van die VMEO sou wees is daar met die insluiting van mnr. van der Merwe en Crompton nou in werklikheid vyf lede.

Hierdie Akkrediteringskomitee het ook alreeds twee keer vergader.

'n Subkomitee bestaande uit mnr. Crompton, Whitehead, Culber en Daniel, met lg. as Voorsitter is gekies om onder andere verslag te doen oor die volgende:

Opleiding van Vakleerlinge in die boubedryf.  
Bepaling van koste van Vakleerlingopleiding by sentra.  
Aanvaarding van opleidingsmaatsstawe en bevoegdheidsstandaarde wat vir plaaslike bestuur aanvaarbaar is.  
Implimentering, beheer en ontwikkeling van opleidingsprogramme en ambagstoetsing.  
Bevordering en bewerkstelling van akkreditering van opleidingsinstellings op tweede vlak, asook die identifisering van Sentra.

En nog hope ander wat te veel is om hier op te noem.

Soos u kan sien is hierdie Opleidingsraad nog in sy kinderskoene en nog baie werk sal gedoen moet word voordat dinge glad sal verloop.

Die Administrasie word voorlopig deur die Johannesburgse Munisipaliteit gedoen waarvoor ons baie dankbaar is.

As gevolg van die kort sitting van die Parlement, kon die stigting van die Vakleerlingraad nog nie amptelik afgekondig word nie, maar alle aanduidings dui daarop dat daar geen probleme ondervind sal word nie.

mnr. Daniel is ook nog besig met die opstel van modules, nie alleenlik vir Elektriese-opleiding nie maar sluit ook ander amptante in. Soos u kan sien is ons President baie diep betrokke in hierdie opleidingsaksie en ons kan hom en sy komitee net sterkte toewens.

#### MNR JAN LOUBSER: BENONI

Ek het nie eintlik iets om by te voeg by wat in die verslag staan nie.

Die goeie nuus is, soos wat daar in die eerste paragraaf verskyn het, dat die besoek wat die vorige President en ekself aan dr Thornhill en mnr Orr van die destydse Staatkundige Ontwikkelingsdiens gebring het, het daartoe gelei dat ons nou meer erkenning kry en ook het ons 'n uitnodiging gehad na 'n Koördinerende Komitee in verband met plaaslike bestuur wat ook 'n direkte gevolg is van ons kontak wat ons daar opgebou het. Ten minste lyk dinge nou baie beter.

U sal onthou by 'n geleentheid het ons bekommerd geraak omdat die VMEO nie self betrokke is in die Vakleerlingopleidingsraad nie. Maar die VMEO is baie diep betrokke in die Akkrediteringskomitee en dit is in werklikheid die komitee wat al die werk doen vir die Opleidingsraad.

Mnr die President, u self is baie diep betrokke hierby, en ek kan nie eintlik byvoeg by wat ek daar gesê het nie. Ek wil net die lede inlig dat u betrokkenheid hier, daartoe gelei het dat u nog baie meer besig gaan wees as wat self in hierdie stadium dink. In die Akkrediteringskomitee word alles verwys na die sogenaamde Danielskomitee, en dit is presies waar ons President betrokke is. Hy het ontsendend baie werk om te doen, maar ek sê weer, u kan maar op ons knoppie druk, ons sal help waar ons kan.

#### MNR F L U DANIEL: PRESIDENT

Baie dankie mnr Loubser, soos u sê ek is diep betrokke daarby, maar my skouers is breed en ek sal maar die mas moet opkom as ons die saak tot volwassenheid wil bring en dit is vir ons eintlik noodsaaklik dat dit so gou moontlik van stapel gestuur word. Dit lyk of dit wel gou in die nuwe jaar afgekondig gaan word in die Staatskoerant en dan kan ons verder voortgaan met die opleiding van Vakleerlinge volgens hierdie nuwe Wet.

#### MNR CHARLES ADAMS: PORT ELIZABETH

Just one question on this training — The new training of apprentices will be in terms of the Act which lays down modules for the training. Can we get some indication of how the preparation of these modules is progressing and when it will be available for us to use? How many modules, what they will cover and generally how we would set about using them?

#### MR F L U DANIEL: PRESIDENT

Charles you are asking difficult questions and you are wanting answers immediately. Eskom has taken something like three years with a special group of specialists writing modules for training. We are hoping to make use of modules that are already available in the market, purchasing them and translating them into AMEU modules. We think this can be done. In essence the various trades that are going to be part of the Local Authorities Training have been defined. The programmes for each trade has been drawn up on the modular training basis with its bubble diagram etc., but as such, no specific modules are available at this stage.

There is liaison with the other Training Authorities to purchase modules and adapt them into the training of local authorities

apprentices as such and we are hoping to gain a lot of time. Provided we can get the initial modules of training available, the Act can be promulgated and we can begin our training. Then further modules to comply with the further training of the apprentices as such, can be completed and we can get our apprentices fully qualified in terms of the new Act. Does that answer your question satisfactorily?

#### **MNR JAN LOUBSER: BENONI**

By die laaste Akkrediteringskomitee is daar 'n vraag gestel, wat ek maar hier moet vra om die reaksie van die Konvensie te kry.

U moet onthou dat as ons nou volgens die modules gaan oplei, dan gaan 'n man een of ander sertifikaat bekom die oomblik as hy die eerste module slaag. Kom ons neem maar as 'n voorbeeld straatligte dan gaan hy nou daartoe in staat wees om straatligte te herstel. Nou doen hy die volgende module en hy slaag dit, en dit mag nou byvoorbeeld 11 000 V skakeltuig wees. Dit beteken hy kan dit nou doen. So gaan hy 'n kwalifikasie

verwerf vir elke module wat hy slaag. Nou is die vraag, is dit nog nodig dat hy 'n finale ambagstoets moet aflê? As hy al hierdie modules geslaag het, het hy reeds gekwalifiseer. Hoekom moet hy nog 'n finale ambagstoets aflê? Dankie Mnr die President.

#### **MNR F L U DANIEL: PRESIDENT**

Mnr Loubser, by voltooiing van elke module word daar getoets. In hierdie stadium is ek self nog nie seker of hy 'n finale toets moet aflê nie, maar ek is daarvan oortuig dat dit nie nodig sal wees om 'n finale toets as sulks te skryf nie. As hy sy finale module klaargemaak het van die Elektriese Afdeling Opleidingskursus, en op daardie laaste module getoets word dan is hy outomaties 'n volwaardige Elektriese as sulks. Dit is my mening en soos ek dit nou verstaan. Ek mag miskien verkeerd wees, maar ons kan in die toekoms verder daarop ingaan en daartoe besin.

## **DEPARTMENT OF MANPOWER**

## **DEPARTEMENT VAN MANNEKRAG**

**A.D. du Plessis**

#### **Mr A.D. DU PLESSIS: DEPARTMENT OF MANPOWER**

Mr President, congratulations with your inauguration, I look forward to two years working with you and the AMEU.

Ladies and Gentlemen, I just want to touch on three aspects. Firstly, earth leakage, secondly rationalisation of electrical installation regulations and thirdly guidance notes.

Earth leakage — a problem arose in the highveld region of an earth leakage unit with an inherent fault, undetected by the Code of Practice or the Standard Specifications for Earth Leakage Units. It caused a fatality of concern to us. We launched a research program, country-wide, and what we found was, that it was a localised problem at that specific place. But we did find that earth leakage units, 5% are inoperative in the normal domestic use. This is a little bit of a concern to us, where this is an item where we rely on, as far as the safe use of electricity is concerned. Domestically and the manufacture of equipment used as well as domestic appliances also rely on earth leakage units.

What we want to do from the departmental side is — we want to go out on a press release — we have already started with this and we want to go out and tell the people to test their units. If for instance we can go out on TV the message will be — Press the button. If the picture disappears you are alright, if not, consult somebody. And that somebody is concerning us now. We would like to know if it is possible for us to mention — Contact the local supplier. If the supplier does not want that, let us know please. We feel that this is part of the service that you do give to the public in your area — it is quite fair for them to contact you. We would also tell them to contact a contractor to have a look.

You know that the malfunction of these units are due to various aspects, either tampered with, bridged-out, disconnected, normal conditions exposed to like moisture, the conditions in the kitchen with fat and dust, so there are various aspects that can cause this unit not to operate properly. It could also happen that people will start to install units where they malfunction or where they don't have them and that is why there is a questionnaire in your bags. It would be good to know what assistance is available for people to have it replaced or installed,

and I think that will go through normal channels to Mr Daniel who will give us some feedback.

Secondly, rationalisation of electrical installation regulations. I want to pose a few questions to the audience here to get their feeling.

First of all I would like to know, how many of you people would still like to carry on registering contractors. We get the feedback that the supplier tells us, "We have become a rubber stamp, we have to register the contractor whether we like him or not".

Secondly we would like to know, do you still want to carry out inspections, because we do a duplication of work. The contractor must have an installation electrician doing an inspection, the supplier must also inspect and neither of them really carries the responsibility at the end of the day.

If it is possible I would like to see, even if just by a show of hands — first of all, how many suppliers are in favour of still keeping on registering contractors. Is it possible to show me and I think the Councillors can also participate in this exercise. It seems that it is something that we can consider.

Secondly, the inspections carried out by municipalities. You know this is a costly effort and it costs the ratepayer money. How many people would like to carry on with the inspections, or would like to stop? Just get a certificate and by the submission of the certificate, supply electricity or do you want to hold onto the inspection and still try to control the power? Are there any people who are prepared to accept a certificate and supply with no responsibility? Not really. Thank you very much.

And then lastly, Mister President, the department is also subject to privatisation and de-regulation which is a very popular word these days. We are trying to write less regulations but more explanations and we have embarked on starting to write guidance notes. So when a set of regulations are published, it is regulations that covers a wide field but not very specific. And then we are embarking on a set of guidance notes which will be available from the Government Printer or any other people that will eventually also get involved in printing these items.

We have written a set of guidance notes on Asbestos some years ago. Lately we published a set of guidance notes "Explanatory Notes on Electrical Installation Regulations". I just want to read the foreword to you. "These documents consist mainly of explanatory notes on the implications and application of the more important regulations concerning electrical installations. The notes are meant to help and guide suppliers, contractors and inspectors. They explain the purpose of the regulations, their meaning and suggested administration as far as suppliers and contractors are concerned."

I would like to hand Mr Daniel, and the AMEU now the first copies.

Ek wil graag drie aspekte hier aanroer en die voeling van die VMEQ daaroor verkry, te wete:

1. Uitslag oor opname en stapte oor aardlekskakelaars.
2. Rasionalisering van die Elektriese Installasie Regulasies.

Hier wil ek graag aansluit by wat Piet Botes aangebied het "Quo Vadis" en wat sprekers daarop bygesê en/of gevra het — met spesifieke verwysing na "Rasionalisering" waarvoor mnr Coen Scherman baie sterk voel en hierby ook "Privatisering".

3. 'n Ietsie oor "Gidsnotas".

#### 1. Aardlekskakelaars

Na 'n onlangse opname wat gemaak is nadat 'n moontlike probleem te berde gekom het, is nie eintlik 'n probleem met aardlekskakelaars gevind nie, dit is noumêr te ontwerp daarvan, maar wel dat daar ongeveer 5% is wat nie na behore funksioneer nie.

- \* Dit sluit in waar die toetsknoppie nie werk nie;
- \* Waar die skakelaar foutief installeer is;
- \* Waar die meganisme uitgebrug of diskonnekteer is;
- \* Waar die hele skakelaar uitgebrug is;
- \* Waar die skakelaar weens omgewingstoestand soos stof, vetterigheid, vog, ens. nie na behore funksioneer nie.

Die Departement van Mannekrag is bekommerd oor hierdie 5% gevalle omdat die veiligheid en die hele elektriese installasie baseer is op die feit dat daar 'n aardlekskakelaar is. Daar is dus reeds stapte aangevoer om 'n persverklaring uit te reik oor aardlekskakelaars om die publiek meer bewus te maak van die skakelaar en dat dit gereeld getoets moet word.

Ek wil graag die volgende weet: Kan daar in die persverklaring gesê word dat, indien die skakelaar nie na behore funksioneer nie, die gebruiker na die voorsiener gaan om raad of hulp of slegs na 'n elektriese kontrakteur?

Watter hulp kan die voorsiener bied aan 'n persoon wat so 'n skakelaar wil vervang of installeer: soos Johannesburg wat 'n finansieringskema het? Verwys na Vraelys: "Assisted Financing Scheme".

2. Ten opsigte van Rasionalisering en Privatisering.

Soos reeds genoem, is daar al heelwat gesê oor privatisering en in 'n mate de-regulering.

- \* Voorsieners kla dat hulle 'n rubberstempel is wat betref die registrasie van kontrakteurs. Hoe voel die lede hier teenwoordig oor die registrasie?

Hier moet ons in gedagte hou dat die kontrakteurs tans 'n Installasie-ekstrisies in hul diens moet hê as 'n voorvereiste om 'n kontrakteur te kan wees. Hierdie persoon moet inspeksies

en toets uitvoer op alle installasiewerk, maar doen hulle dit natuurlik uit die oogpunt van die kontrakteur en sy belange.

U het natuurlik ook Installasie-ekstrisies in u diens wat, volgens Wetgewing, 70% van alle installasies moet inspekteer voordat toestemming gegee kan word vir aansluiting van die toevoer. Hierdie inspeksie word weer gedoen uit die oog van die voorsiener gesien wat baie maal op 'n interpretasieprobleem uitloop en aldaar die appelle wat aangeteken word.

Ek wil nou graag die vraag vra:

- \* Wil u, die voorsiener, enige verantwoordelikheid hê oor die stelsels van gebruikers. Sal u nie tevrede wees met slegs 'n behoorlike toetsertifikaat dat die installasie voldoen aan voorafbepaalde standaarde (SABS 0142) en op grond daarvan 'n aansluiting toelaat?
- \* Kan die inspeksie van installasies nie gesetel word in een goed gekwalifiseerde persoon (beter as tans) wat nie noodwendig aan die kontrakteur of 'n organisasie gekoppel is nie en nie op u diensstaat is nie?

Om 'n aanduiding te kry van u gevoel oor hierdie soort vrae sal ek graag by wyse van 'n hande-op wil sien hoe u voel hieroor.

Do suppliers want to register Contractors?

Do suppliers want to control electrical installation work, inspect and test it and hang on to the idea of responsibility for the safety of the system?

You have to guarantee the quality of the electricity you supply. Why also for the way it is used?

Attie van der Berg mentioned yesterday that Eskom and other institutions (I am one of these others) has a move to supply cheaper electricity to specifically underdeveloped areas.

I want to stress it should be the provision of "electricity cheaper" and not "cheap electricity".

This is not only the distribution, but also the installation of the private property = the readyboard.

Ek hoop u het verstaan wat dr Du Plessis van die SABS in die Hoofrede gesê het. Minder maar beter standaarde.

3. Gidsnota No. 2: Verduidelike aantekeninge oor die Elektriese Installasie Regulasies, 1985.

'n Kopie aan die VMEQ en een aan u persoonlik.

Ek wil dit asb. so aan u bekend stel en noem dat dit beskikbaar is by die Staatsdrukker teen R6,15 per kopie. Dit is in Engels en Afrikaans beskikbaar en ek is van mening dat beide die voorsiener en die kontrakteur baat daarby kan vind.

Baie dankie mnr die President.

## ACKNOWLEDGEMENTS AND CLOSING OF THE CONVENTION BEDANKINGSWOORD EN AFSLUITING VAN DIE KONVENSIE

### MR F L U DANIEL: PRESIDENT

#### WELCOME TO THE MAYOR

Ladies and Gentlemen we have come to the closing stages of this Convention and we are indeed indebted to our Mayor who has come back to join us again this afternoon, and in his busy program, give us some of his time. Mister Mayor it is indeed a pleasure that you have joined us and the keen interest that you have displayed in the AMEU and the activities around this Convention, have also contributed to the success of what has taken place here over the last few days and we are really pleased to see you here and have you in our midsts again and look forward to hearing from you in your closing address.

### MAYOR OF CAPE TOWN, ALDERMAN G R OLIVER

Mr President, Ladies and Gentlemen, I firstly would like to apologise for the fact that I have arrived late. I know that I

was scheduled to be here some 20 minutes ago and please forgive me for that — no disrespect was meant.

May I say also, I am really quite impressed to see just how many of you are here, that you have survived this great long Convention and I do pay tribute to you for that, but that is perhaps a wee bit tongue in cheek and I don't mean to be flippant or disrespectful, but what I would like to say just by way of a few closing remarks, is the fact that firstly as I said the other day, we in Cape Town are truly grateful, delighted and pleased that you as an association of professional people, had decided to bring your Convention here again.

I hope that you have felt the warmth of our welcome. It's very important for us to know that we can welcome you with open arms and that we hope that you will come back again to our city as individuals and in fact come to spend a bit more time with us in a more relaxed and casual sort of way.

I also would like to say to you, and I mean this sincerely, that the fact that you have made so much time available to this Convention, to gather here to share as professionals and to listen to professionals in your particular field, speaks volumes for the earnestness and the urgency and the seriousness with which you approach your profession, in that one of the major things that we tend to overlook in business and in fact in all walks of life, is the need for re-training. While we are qualified or skilled in a particular expertise or skill, one can never have enough training.

There is always the need for re-training and I often think of the point that was made by the Managing Director of a company for which I worked as the Personnel and Training Manager, some years ago when we started the first of a series of Management Development programs. The Managing Director opened that program and he made the comment which perhaps may have been a wee bit exaggerated, but he said to us at that stage, that the need for training is so urgent, and this was in the sixties, the need for re-training was so urgent that on the basis of "What you learnt 20 years ago or more is now obsolete." Now I don't think that is necessarily or entirely true, but perhaps in your particular field what you were doing 20 years ago is obsolete compared to what you do today. Certainly I am sure in the engineering field that is the case. I learnt something from what that man said and I have always placed great value on the need for us to undergo experiences of re-training in our particular fields. I commend you for that and I commend your association for creating that kind of opportunity where you can share and update yourselves and sharpen your skills in your particular field.

May I just in conclusion say to all of you, particularly those of you who are municipal electrical engineers, that we as public representatives, certainly in the City of Cape Town, are extremely highly appreciative of the calibre and the role that you bring to your profession, that you bring to our City. I know that if I look at a man like Fred Daniel and his team, his staff, and that goes for the other skills in our City, and it applies to all Cities and Towns. We are extremely blessed as Capetonians to have people of that calibre and of that expertise serving our City. It is a service which you render. You may perhaps tend to overlook that fact, that you are serving the community, it is not just a job that you are doing. And service given in a skilled and competent way because you care, is that much more meaningful to us as ordinary citizens who live in a City like Cape Town.

So please know that I am privileged to be associated with you in this very small way. I am grateful for the opportunity of sharing, for a few minutes like this with you. I sincerely hope that you will come back to Cape Town as a profession and as individuals and I thank you for what you are doing for our Country at a time when the challenges are so great and a time when change is so imminent that your role is particularly powerful and vital in that change process. So keep up the good work, do keep up the standards in the change process and I wish you well and every success to you in your profession and for those of you who've got long distances to travel back home, travel safely and God speed.

#### **MR F L U DANIEL: PRESIDENT**

Mr Mayor, thank you for those kind words. As I said we do appreciate you being able to be here with us this afternoon. Next we go onto our affiliates and I would like to ask Brian Madeley, if he would address us on behalf of the affiliates.

#### **MR BRIAN MADELEY: CHAIRMAN AFFILIATE COMMITTEE**

Dit is voorwaar 'n groot plesier en voorreg om vereer te word met die geleentheid om die sluitingsrede namens die VME0 geaffilieerdes te lewer.

Mr President we congratulate you on your appointment to the highest office within the realms of the AMEU. To you and Mona, a happy prosperous and I know hard working 2 years, and we offer as affiliates any assistance that you may require.



*The President Fred Daniel thanking Mr Brian Madeley, Chairman of the Affiliates Committee.*

Mr Adams — our congratulations go to you on your election as president elect of the AMEU and to you and Audrey, we know that the next 2 years will be a wonderful build up period to your term of office.

Ladies and gentlemen, it appears that the "kykdaars" will be gracing the mother and daughter cities over the next 4 years.

Aan Bennie van der Walt, ons opregte dank en waardering vir u belangstelling, advies en vriendskap. Ons weet u geniet ons golfdae en vergaderings en ons sien uit na nog baie jare van samewerking.

#### **What is an AMEU affiliate?**

He is a member of a very elite group of business men, dedicated to furthering the technological aspects of the electrical and electronic industry in South Africa and is associated to the Association of the municipal electricity undertakings.

Prior to 1972 a small group of companies with perhaps the same interests as we have today; banded together and were under the control of the then Secretary, a Mr Ewing, and were the fore-runners of what we are today.

In 1972 this group of companies decided to voice their rights and requests for recognition and in 1974 the affiliates were recognised.

In 1975 the 1st affiliates committee was formed and continued as such until 1983, when Mr Wessel Barnard assisted the affiliates committee to become more active and independent to further the aims of the AMEU and the AMEU affiliates. A set of rules and regulations were drawn up to help administer the affairs of the affiliates and golf days and other functions were organised to raise funds. A very successful 2 day exhibition was held recently in Nelspruit to coincide with a Highveld Branch meeting. In view of the response for this function in Nelspruit we have been asked for a repeat performance early in the new year.

Verby is die dae van rond-bel om geld in te samel om affiliaat-funksies te borg en ek twyfel of daar weer 'n tekort aan finansies in die toekoms sal wees.

Aan die begin van 1988 het ons sowat 132 aktiewe lede gehad en vandag staan ons ledetal op 165.

The AMEU affiliates is a peoples organisation and to all those people who did so much for us in the past — we salute you. One name in particular is in the forefront of those active members. A man who has never missed a convention or technical meeting in 35 years, except this year. This man was honoured for his untiring dedication through the years by becoming the 1st life member of the affiliates. He is Mr Terence Marsh.

I wish to convey our sincere thanks and appreciation to Al and Joy Fortmann who have both been outstanding friends to the affiliates and helped to make this association what it is today. To the AMEU executive for being part of us, and to our on-ward association for years to come. To Max Clarke and the AMEU magazine: keep up the excellent work.

I would also personally like to thank my Committee for their support, dedication and friendship over the past 2 years. It goes to show that competitors can happily work together.

To all the affiliate members who rally around when asked, who dig deep into their pockets and who help to make this all worthwhile. To those who sponsored, exhibited and participated, I thank you.

Mr President, members of the AMEU — we are your association and willing and able to be of assistance to you when required. You simply have to ask.

Thanking you.

#### **MR F L U DANIEL: PRESIDENT**

##### **Thank you to the affiliates**

Charles and I are not shy in calling for help and we will be knocking on your door for help. I know when we knock and call, everything will be answered and we will get the greatest co-operation from the Affiliates. I am sure in my term of office we will do everything to further these bonds that have been created between the AMEU and the Affiliates and I can see that we will go from strength to strength. Brian and your committee, thank you very much for all you've done. I'll be thanking you further, but at this stage, very very many thanks.

The gentleman who most of us will envy, he is always the fellow who is doing the pleasant things in life, he doesn't have to sing for his supper, he has his supper brought to him and everybody treats him with respect. Peter you now have the very pleasant task of thanking the Ladies. We all know you are a ladiesman and I don't blame you for being a ladiesman, we've got very charming ladies that have been with us for the past three days and I was wondering why we never saw you here at the Convention, but thank you for joining us now. Peter if you would do the necessary, thank you very much.

#### **MR P J MULLER: ON BEHALF OF THE LADIES**

Mr President, Mr Mayor, Members of the Association, Ladies and Gentlemen — Ladies in white, ladies in pink, ladies in blue, Mr President, we all are aware of how our ladies have graced the 51st convention of the AMEU.



*Mr Muller expressing a word of thanks on behalf of the ladies.*

Mr President, it gives me great pleasure to make a closing speech on behalf of the ladies. The AMEU function is a wonderful occasion to which I for one, and no doubt together with everyone here, look forward with great enthusiasm, and the enjoyment of the event is attributable in no small measure to the company of the ladies here present.

Die afgelepe paar dae in hierdie seer sekerlik die pragtigste stad van ons land het die dames van die Vereniging van Munisipale Elektriese Ondernemings sonder twyfel bygedra om hierdie omgewing nog mooier te maak. Swier is aan die openingseremonie verleen en ook weer eens met hierdie sluitingsseremonie.

Ek verneem dat u tydens hierdie byeenkoms u tyd verwyd het met 'n propvol en hoogs interessante program en dat u saam met u wederhelftes hier kon wees, is van wesentlike belang vir die sukses van 'n konvensie soos hierdie.

Dit ly geen twyfel nie dat dames 'n belangrike deel van ons samelewing vorm — sonder hulle is daar geen lewe en met dit in gedagte het ek vir hierdie toespraak gaan kyk wat beroemde mense te sê gehad het oor die vrou.

Ek haal Sigmund Freud aan: "Ondanks my dertig jaar lange navorsing in die siel van die vrou, is dit vir my vandag nog nie moontlik om die groot vraag wat nog nooit beantwoord is te beantwoord . . . wat is dit wat 'n vrou wil hê?"

Sigmund het dit nie uitgevind nie en ek ook seer sekerlik nie



*Al en Joy Fortmann at the closing session.*

maar ek is daarvan oortuig dat die dames graag weer deel wil wees van die twee en vyftigste konvensie!

Dwight D Eisenhower once said, "Well, it's hard for a mere man to believe that woman doesn't have equal rights." And famous statesperson Golda Meir once said, "Whether women are better than men I cannot say — but I can say that they are certainly no worse."

It is here where I must agree whole-heartedly with this great woman and here at the AMEU Convention they certainly looked a lot better than any of us males.

Baie is al deur die jare deur bekendes oor vroue gesê maar ons sê vandag vir u:

"Dames dit is vir ons as mans aangenaam om u elke jaar by hierdie konvensie teenwoordig te hê omdat ons glo dat die sukses van hierdie konvensie, en ook dié van ons mans, die resultaat is van u volgehoue ondersteuning, soos 'n baie bekende en ware gesegde lui: 'Agter elke suksesvolle man staan 'n vrou'."

Ons dank u vir u bereidwilligheid om na ons mans te luister, om mooi, bekoorlik en vroulik te wees en om 'n bondgenoot te wees vir al die kinders se probleme.

But more of what has been said of the fair sex.

I like John Erskine's definition of beauty and charm. He said: "Beautiful women are the ones that I notice, a charming woman is the one that notices me."

According to Pedro Calderon "a woman's advice is not worth much, but he who doesn't keep it is a fool".

And then of course there is the comment that a woman may agree to "forgive and forget" but she seems still to have a remarkable habit of referring to the matter every now and then.

Victor Hugo said that the supreme happiness of life is the conviction that you are loved by a woman and Oscar Wilde — a very effective commentator on the subject said — that when a man marries again, it is because he adored his first wife.

Lincoln was quite direct — he said that the Lord preferred beautiful women — that is the reason he made so many of them.

The Africans have a very clear understanding of the importance of women: according to an old African proverb, if you want peace in the house, do what your wife wants. And as further evidence of the complexity of the female gender, he said, "How can anyone so incredibly beautiful be so incredibly stupid?" She said, "Oh the Lord planned it, so that you would be attracted to me and I would be attracted to you."

May I conclude in saying that if advocates are disbarred, clergymen defrocked, dry cleaners de-pressed, doesn't it follow that Electrical Engineers can be de-lighted?

Mr President, I have no doubt that you will agree with me that you were delighted as indeed we all were to have our ladies here with us on this wonderful occasion.

Dit is dan ook met groot genoeë dat ek namens die dames hier teenwoordig dank uitspreek vir die uitstekende organisasie en gasvryheid wat hulle hier van u en u komitee mog ontvang.

#### MR F L U DANIEL: PRESIDENT

Mr Mayor of Cape Town, Alderman G R Oliver, honoured guests, ladies and gentlemen.

The time has come to conclude the proceedings after nearly three days of very lively deliberation.

The events at this Convention were the climax and culmination of many months of planning and organising, involving numerous people from Cape Town and elsewhere.

It is extremely difficult to single out persons and organisations who have contributed to the success of such a convention without running the risk of unwittingly excluding one or more persons with resultant unhappiness. Should I fall into this trap please attribute it to my inexperience.

To each and everyone who has in any way, no matter how small, contributed to the success of this convention, a deep and sin-



Annetjie van der Walt word deur President Fred Daniel gevra om 'n geskenk aan Mona Daniel te oorhandig.

cere thank you. On his own, the President's task is a difficult 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.

Mnr die Burgemeester, my innige dank en waardering aan u en u Raad namens die VMEO, die afgevaardigdes en hul gades, vir u bereidwilligheid, dat hierdie 51e Konvensie hier in Kaapstad kon plaasvind asook die aangename burgerlike onthaal wat u en u Raad Maandagaand by die Burgersentrum aangebied het.

Ek hoop en vertrou natuurlik dat die bande wat by hierdie Konvensie gesmee is tussen die assosiasie en Kaapstad en die VMEO in die toekoms behoue sal bly.

Baie dankie ook aan dr D C Neethling wat ons vereer het om die Konvensie amptelik te open en dr J P du Plessis wat 'n stimulerende hoofrede gevoer het. Baie dankie ook dat u die tyd kon afstaan om na die Kaap te reis vir hierdie belangrike Konvensie.

'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 net ingespring het met hulp. My hoë waardering aan al daardie lede.

Groot dankie ook aan die personeel van my departement. 'n Klompie van die name is:

Dames: Patsy Sierra (my sekretaresse)

Pat Hodgson  
Marina du Toit  
Wendy Wiid  
Jenny Meyer

Mans: Peter Boyd-White

Les Smith  
Blackie Swart  
Willem Swart  
Robert Vine  
Guisepppe Ricci  
Paul Bland  
Dave Donald  
Roy Blaser  
John Ladeira  
Grant Ziervogel  
Trevor Kerr  
Martin Pollack  
Bruce Sutherland

To the authors of the papers, our heartiest thanks for the 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. To our delegates from overseas we are deeply indebted to you for travelling to Cape Town and your very valuable contribution to the Convention and we trust the bonds we now have established will be further strengthened in the future.

Baie dankie aan Alwin Fortmann wat as President my gedurig bygestaan en my van advies voorsien het. Dankie ook aan Charles Adams vir sy morele ondersteuning tydens hierdie Konvensie en byvoorbout vir sy ondersteuning vir die komende twee jaar.

Firstly, our affiliate committee, who as a group need special mention. Of course, I have already thanked individual companies for sponsoring the delegates luncheons and the other enjoyable events and 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 at the Parow Golf Club.

Then we have the tours and luncheons for our ladies — Monday the Boschendal treat by African Cables. The roses and chocolates made the tour all the more memorable. Tuesday the tour of the Peninsula by Aberdare Group who sponsored beautiful weather as well as besides spoiling the ladies with beautiful wallets and six wonderful prizes. The prize of the day a holiday for two was won by none other than Carol Fraser. Well done to the honorary members.

The delegates luncheons proved to be equally good, NEI Electrical Division requesting Cutler Hamer, power engineers and Reyrolle on Monday complete with note pads and pens. Tuesday was equally enjoyable, the hosts being GEC and today Kennedy and Donkin in association with SA-PVC continued the spoiling of the delegates.

Then we come to the special item. The very useful briefcases by the Aberdare Group which included key ring and road map by BBT and the note pad by Siemens.

Similarly on Sunday night Control Logic entertained the Executive Council and their spouses to a dinner and Mr Bos was an excellent host.

Let's not forget the colourful galypso evening at the Civic Centre also excellently hosted by the affiliates. Brian Madeley at his best.

The Wednesday treats for the ladies arranged by the affiliates included shopping at the Tygerberg Shopping Centre with lunch at the Glockenberg Hotel, sponsored by:

3M Company  
Aluex  
Bowthorpe Hellermann  
Circuit Breaker Industries  
Eberhardt-Martini  
H V Test  
John Kenyon  
Larry Baranett  
Linegear 2000  
Vaalcor  
Waco  
Yelland Engineering  
Yorkshire Switchgear

Ladies and Gentlemen we are deeply indebted to the affiliates, ably led by Brian Madeley for maintaining and strengthening the bonds between our associations. This unique relationship does a good deal to enhancing the Convention.

There are also other firms, not affiliated to the AMEU who have made their contributions — Trek Petroleum for their monetary contribution as well as BP SA for their contribution of stationery items for the delegates.

On behalf of the AMEU a hearty thank you and I sincerely hope that this relationship will continue with future conventions.

Messrs Circuit Breaker Industries Ltd for the ½ Kruger Rand and two ¼ Kruger Rands for 1st, 2nd and 3rd prizes respectively for the AMEU Banquet 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 who have added colour to the Convention. This is also appreciated.

In the build-up to the Convention and now during the Convention I am pleased and proud to have had my wife, Mona, to assist and stand by me and who played an important part in the ladies' programme. Mona, a big thank you for your invaluable assistance.

Mona was aided by Joy Fortmann, Audrey Adams 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 ek en hy was dikwels, feitlik voortdurend, in verbinding oor die reëlings van die Konvensie.

Hy, met al die jare ervaring, en ek as 'n nuweling, het baie deurgemaak en ek het baie van Bennie geleer en natuurlik het hy 'n reuse-taak 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 die vernuf wat hy aan die dag gelê het.

Many thanks to Management of the Cape Sun Hotel for their assistance and courtesy displayed throughout the Convention and in particular to Casper Groenewald who so ably saw to our needs 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. Annetjie van der Walt to present Mona Daniel with a gift and Mona to present Audrey and Annetjie with a gift. Bennie will present the members of my staff each with a gift.

#### MEV ANNETJIE VAN DER WALT

Ek wil die pragtige ruiker oorhandig aan ons eerste dame Mona en ons wil haar verseker daarvan dat ons haar sal bystaan in alles wat sy mag doen, ook aan Audrey. En ek wil net sê, julle manne dink ons beteken nie regtig iets nie, but we had an education tour these past few days. Instead of enjoying the surroundings on Monday as well as enjoying the good champagne and the good food we had to listen to a lecture by Jerry Stevens on supertension accessories, which in the end only meant bras and girdles, and Mr Lang had a speech as we walked in and he mentioned joints. Conventional joints, he showed us a slide, which looked to us ladies very much like a belt and buckle. So maybe we are just stupid. Maar wees verseker dat ons by julle staan, dat ons vir julle sal luister as dit ons pas, op voorwaarde dat julle vir ons ook luister want ons weet gewoonlik beter. Mens dra nie 'n blou pak klere met groen sokkies nie. Jy dra ook nie 'n rooi pak met 'n geel das nie, so luister vir jou vrou and the AMEU will be on the right track. Thank you very very much for treating us to capacity, it was a super, but super few days and thank you very much to all the Affiliates as well.

The following delegates will retire before the next Convention:

P J Botes — Roodepoort  
K van Alphen — SABS  
N Kirschner — Reyrolle Switchgear  
J D Dawson — Uitenhage  
E G Davies — Pietermaritzburg  
M P P Clarke — Randburg



**MR CHARLES ADAMS: THE PRESIDENT-ELECT**

Mnr die President, eregaste, dames en here, tot dusver het ek maar stil gesit en luister na die besprekings van al die referate. Ek het stil gesit, maar noukeurig opgelet hoe die Konvensie verloop het. Dis vir my duidelik dat hierdie die mees suksesvolle Konvensie was wat nog ooit gehou is. Al die reellings was foutloos, en het vlot geloop, nie net hier in die saal nie, maar ook so ver dit die reellings van die dames-program betref het.

Mr President, it is obvious that a great deal of thought and effort have gone into the arrangements for this occasion, and all this can only have been achieved due to your drive and enthusiasm. The evidence that the Convention has been a great success lies in the number of delegates who attended the afternoon sessions. Some might have closed their eyes occasionally, to concentrate better, but there were certainly more attendees than usual, considering the temptation of the good weather this week, this is a great tribute to you Mr President.

Fred, you have thanked all your helpers, sponsors, etc. and it is now my pleasant duty to thank you for making this Convention so enjoyable. You proved you could do it a couple of years ago, but this time you surpassed yourself.

I am sure everyone here will endorse my words when I say "thank you Fred for a job well done". Ladies and gentlemen please join me in a hearty round of applause for the President.

**MR FRED DANIEL: PRESIDENT**

Baie dankie Charles vir u mooi woorde, ek waardeer dit wat u gesê het ten seerste.

Dames en here, ek hoop dat u almal die VMEO se dinee/dans vanaand hier in die Cape Sun Hotel sal bywoon, waar ons heerlik saam sal kan verkeer.

Die van u wat nie sal kan kom nie en wat reeds vandag nog u reis huis toe aanpak en ook natuurlik vir die res van u, wat dan môre en later huiswaarts keer, wens ek 'n veilige reis terug.

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 51st AMEU Convention closed at 16:00 on 4th October 1989.

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# MEMBERSHIP LIST — LEDELYS

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LEWIS L: City Electrical Engineer, PO Box 5011, Windhoek 9000  
LIEBENBERG HDG: Elektrotegniese Ingenieur, Posbus 64, Ladybrand 6745  
LINDE AP: Hoof Elektriese, Posbus 2, Frankfort 9830  
LOCHNER J VAN S: Elektrotegniese Stadsingenieur, Posbus 111, Pietersburg 0700  
LOTTER GA: Elektrotegniese Ingenieur, Posbus 34, Potgietersrus 0600  
LOUBSER DPVP: Posbus 27, Douglas 8730  
LOUBSER JA: Elektrotegniese Ingenieur, P/Sak X014, Benoni 1500  
LOUW HAL: Elektrotegniese Ingenieur, Posbus 12, Paarl 7620  
LOUW JG: Elektrotegniese Stadsingenieur, Posbus 100, Goodwood 7460  
LOUW L: Elektrotegniese Ingenieur, Posbus 16, Prieska 5940

**M**  
MACLACHLAN AC: Town Electrical Engineer, Private Bag X20, Vredenburg 7380  
MALAN JG: Elektriese/Meganiese Ingenieur, Posbus 13, Kempton Park 1620  
MALLINSON RJ: Elektrotegniese Stadsingenieur, Posbus 3, Strand 7140  
MARAIS CHA: Elektrieseits Meganiese Ingenieur, Posbus 359, Parys, 9585

McNAMARA AB: Electrical Engineer, PO Box 21, Komga 4950  
MEYER A: Elektrotegniese Ingenieur, Posbus 52, Malmesbury 7300  
MILLARD RC: Town Electrical Engineer, PO Box 255, Oudtshoorn 6620  
MOSTERT JN: Elektrotegniese Ingenieur, Posbus 52, Robertson 6705  
MOSTERT AH: Stadslektrotegniese Ingenieur, Posbus 53, Swakopmund 9180  
MULDER JAC: Elektriese Ingenieur, Posbus 60, Piketberg 7320  
MÜLLER FJ: Elektriese Ingenieur, Posbus 20, Zaaron 9950  
MURPHY KJ: Town Electrical Engineer, PO Box 19, Somerset West 7130  
MYBURGH G: Elektrotegniese Ingenieur, Posbus 4, Kuruman 8460  
MYBURGH PA: Assistent Direkteur, P/Sak X11280, Nelspruit 1200

**N**  
NAUDE B: Hoof Elektriese Distribusie, Posbus 17, Stellenbosch 7600  
NAUDE E: Elektrotegniese Stadsingenieur, Posbus 725, Carletonville 2500  
NIEUWOUDT JGH: Elektrotegniese en Dorpswater Ingenieur, Posbus 24, Montagu 6720  
NORTJE GJ: Elektrotegniese Stadsingenieur, Posbus 145, Germiston 1400  
NORTJE JJ: Elektrotegniese Stadsingenieur, Posbus 10, Warrenton 8530

**O**  
OPPERMAN DJ: Elektrotegniese Stadsingenieur, Posbus 45, Springs 1560

**P**  
PAGEL PVE: Elektrotegniese Ingenieur, Posbus 26, Plettenbergbaai 6600  
PEENS JG: Elektrotegniese Ingenieur, Posbus 6, Wesselsbron 9680  
PELSER WH: Elektrotegniese Ingenieur, Posbus 31, Coligny 2725  
PERRYER HO: Town Electrical Engineer, PO Box 113, Queens town 5320  
PETERS AG: Town Electrical Engineer, PO Box 278, Gwelo, Harare, Zimbabwe  
PIENAAR JF: Elektrotegniese Ingenieur, Posbus 10, Glencoe 2930  
PIKE E: PO Box 57, Vryheid 3100  
POLLOCK T: Electrical Engineer, PO Box 3, Gordons Bay 7150  
PRITCHARD MR: Elektrotegniese Stadsingenieur, Posbus 708, Welkom 9460

**R**  
RAUTENBACH GF: Elektrotegniese Ingenieur, Posbus 99, Klerksdorp 2570  
RICHARDS AJ: City Electrical Engineer, PO Box 176, Grahamstown 6140  
ROHRBECK WD: Posbus 39, Hoopstad 2670  
ROODT MJG: Hoof Elektriese, P/Sak X1011, Aliwal-Noord 5530  
ROODT JSG: Hoof Elektriese Departement, Posbus 26, Reitz 9810  
ROOS JJ: Town Electrical Engineer, PO Box 25, Edenvale 1610  
ROSSOUW AP: Elektrotegniese Ingenieur, Posbus 21, Somerset-Oos 5850  
ROSSOUW GT: Posbus 241, Jan Kempdorp 8550  
ROSSOUW JN: Elektrotegniese Stadsingenieur, Posbus 42, Mmabatho  
ROSSOUW N: Hoof Elektrieseitsbeampte, Posbus 60, Piketberg 7320

**S**  
SCHERMAN CJ: Stadslektrotegniese Ingenieur, Posbus 423, Pretoria 0001

SIMPSON AC: Town Electrical Engineer, PO Box 42, Despatch 6220  
SMALL CTR: Town Electrical Engineer, PO Box 9, Beaufort West 6970  
SMITH AH: Elektrotegniese Ingenieur, Posbus 33, Barberton 1300  
SMIT JJ: Elektrotegniese Stadsingenieur, Posbus 2729, Witbank 1035  
SPENCER JJ: Electrical Engineer, PO Box 15, Estcourt 3310  
STAPLETON R: Borough & Electrical Engineer, PO Box 37, Eshowe 3815  
STEYN JN: Hoof Tegnie Beampte, Posbus 83, Hartswater 8570  
STEYN JS: Elektrotegniese Stadsingenieur, Posbus 113, Potchefstroom 2520  
STONE RAA: Manager — Distribution, PO Box 965, Umtata, Transkei 5100  
STRAUSS JC: Bestuurder Tegnie Dienste, Posbus 60, Sasolburg 9570  
STRICKLAND MRC: Electrical Engineer, PO Box 1073, Cape Town 8000  
SWART JCP: Elektrotegniese Ingenieur, Posbus 29, Veldrifer 7365  
SWART LM: Elektriese in Beheer, Posbus 73, Alexandria 6185  
SWART TL: Elektrotegniese Ingenieur, Posbus 10, Glencoe 2930

**T**  
TENCATE JJ: Elektrotegniese Stadsingenieur, Posbus 67, Phalaborwa 1390

**U**  
UYS PJJ: Hoof Tegnie Beampte, Posbus 90, Thabazimbi 0380

**V**  
VAN DEN BERG J: Elektrotegniese Stadsingenieur, Posbus 20, Stilfontein 2550  
VAN DEN BERG AJ: Elektrotegniese Ingenieur, Posbus 94, Krugersdorp 1740  
VAN DEN BERG RJ: Town Electrical Engineer, P/Bag X20, Halfway House 1685  
VAN DER LINDE JL: Elektrotegniese Stadsingenieur, Posbus 21, Odendaalsrus 9400

VAN DER MERWE AJ: Elektrotegniese Stadsingenieur, Posbus 3704, Bloemfontein 9300  
VAN DER MERWE G: Posbus 96, Louis Trichardt 0920  
VAN DER MERWE PJ: Elektrotegniese Stadsingenieur, Posbus 20, Stilfontein 2550  
VAN DER RIET R: Hoof: Elektrotegniese Dienste, Posbus 100, Durbanville 7550  
VAN DER WALT FSP: Assistent Direkteur, P/Sak 5005, Kimberley 8300  
VAN DER WALT PS: Posbus 3, Bultfontein 9670  
VAN DER WATT BG: Town Electrical Engineer, PO Box 44, Ceres 6835  
VAN HEERDEN JS: Electrical Engineer, Carelsberg 238, Erasmusrand 0181  
VAN RENSBURG CMJ: Hoof: Elektriese Dienste, Posbus 35, Vryburg 8600  
VAN ROOYEN HE: Dorps- Waterwerke & Elektrotegniese Ingenieur, Posbus 47, Kirkwood 6120  
VAN ZYL J: Elektrieseit/Waterwerke, Posbus 116, Ficksburg 9730  
VAN STADEN PC: Tegnie Assistent Elektries, Posbus 12, Bothaville 9660  
VENTER J: Elektrotegniese Hoofbeampte, P/Sak X340, Naboomspruit 0560  
VENTER GA: Elektrotegniese Ingenieur, Posbus 9, Meyerton 1960  
VELDSMAN DE: Elektrotegniese Ingenieur, P/Sak X7, Goodwood 7460  
VILJOEN WJ: Elektrotegniese Stadsingenieur, P/Sak X8, Orkney 2620  
VOSLOO C: Elektrotegniese Ingenieur, Posbus 1341, Pretoria 0001  
VOSLOO C: Elektrotegniese Ingenieur, Posbus 201, Heidelberg 2400  
VON BARDELEBEN FP: Electrical Engineer, PO Box 33, Tongaat 4400

**W**  
WHEELER DJ: Elektrotegniese Ingenieur, Posbus 13, Burgersdorp 5520  
WHITEHEAD HR: City Electrical Engineer, PO Box 147, Durban 4000

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#### ASSOCIATE MEMBERS — ASSOSIAATLEDE

**B**  
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BASSON FJC: Ingenieursassistent, Posbus 22, Ashton 6715  
BOSHOF MHL: Senior Electrical Engineer, 20 Bradley Road, Summerstrand, Port Elizabeth 6001

**C**  
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COETZEE CJF: Adjunk-Elektrotegniese Stadsingenieur, P/Sak X30, Roopepoort 1725  
COOPER-CHADWICK L: PO Box 57, Germiston 1400

**D**  
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DE WET LDM: Adjunk-Elektrotegniese Stadsingenieur, Posbus 215, Boksborg 1460  
DELPORT JLFG: Soweto Elektrot. Stadsingenieur, P/a Posbus 886, Bedfordview 2008  
DIBB KG: Deputy City Electrical Engineer, PO Box 147, Durban 4000  
DREYER JGG: Adjunk-Elektrotegniese Stadsingenieur, Posbus 4, Alberton 1450  
DU PLESSIS CJ: Posbus 868, Kempton Park 1620  
DU PLESSIS GC: Adjunk-Elektrotegniese Stadsingenieur, Posbus 94, Krugersdorp 1740

**G**  
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GREENFIELD JW: PO Box 20, Gonubie 5256

**H**  
HATTING CJP: Geelhoutstraat 6, Kingshill, Harrismith 9880  
HEATH PA: Assistent Town Electrical Engineer, PO Box 25, Edenvale 1610

**J**  
JOUBERT JN: Adjunk-Elektrotegniese Stadsingenieur, Posbus 45, Nelspruit 1200

**L**  
LABUSCHAGNE PHJ: Adjunk Direkteur, Tegnie Dienste, Atherstonest 19, Vanderbijlpark 1900  
LAMPRECHT BC: P/Sak X015, Benoni 1500  
LOOTS MR: Assistent Elektrotegniese Ingenieur, Posbus 136, Ellisras 0555

**M**  
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MUNRO GWF: Deputy City Electrical Engineer, 1 Savoy Street, Suider Paarl 7646  
MYBURGH G: Munisipale Elektrotegniese Ingenieur, Posbus 4, Kuruman 8460

**O**  
OLIVIER J: Posbus 60, Sasolburg 9570

**P**  
PRETORIUS JW: Adjunk-Elektrotegniese Stadsingenieur, Posbus 23, Nigel 1490

**S**  
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SMIT RC: Posbus 3, Bultfontein 9670

**T**  
THIRION CL: Adjunk-Elektrotegniese Stadsingenieur, Posbus 42, De Aar 7000

**V**  
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VAN DER WALT WFJ: Assistent Elektrotegniese Ingenieur, Posbus 17, Stellenbosch 7600  
VAN HEERDEN C: Assistent Hoof: Elektrotegniese Dienste, Posbus 100, Durbanville 7550  
VAN NIEKERK PJS: Deputy Electrical Engineer, P/Bag XI, Randburg 2125  
VAN ROOYEN PJ: Adjunk-Elektrotegniese Ingenieur, Posbus 6736, Bloemfontein 9300

**W**  
WILLE J: Assistent Elektrotegniese Ingenieur, Posbus 7, Lichtenburg 2740  
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## UNDERTAKINGS/ONDERNEMINGS

**A**  
ADELAIDE MUNICIPALITY, PO Box 38, Adelaide 5760  
ALEXANDRIA MUNISIPALITEIT, Posbus 73, Alexandria 6185  
ALIWAL NORTH MUNICIPALITY, PO Box 46, Aliwal North 5530  
ASHTON MUNISIPALITEIT, Posbus 22, Ashton 6715  
ATTERIDGEVILLE CITY COUNCIL, PO Box 90, Atteridgeville 0008

**B**  
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BARBERTON MUNICIPALITY, PO Box 33, Barberton 1300  
BEACONBAY MUNICIPALITY, PO Box 2001, Beacon Bay 5205  
BEAUFORT WEST MUNICIPALITY, PO Box 9, Beaufort West 6970  
BEDFORDVIEW MUNICIPALITY, PO Box 3, Bedfordview 2008  
BENONI MUNICIPALITY, PO Box 45, Benoni 1500  
BELLVILLE MUNISIPALITEIT, Posbus 2, Bellville 7535  
BETHAL MUNICIPALITY, PO Box 3, Bethal 2310  
BETHLEHEM MUNICIPALITY, PO Box 551, Bethlehem 9700  
BLOEMFONTEIN MUNICIPALITY, PO Box 288, Bloemfontein 9300  
BOKSBURG MUNICIPALITY, PO Box 215, Boksburg 1460  
BONNIEVALE MUNICIPALITY, PO Box 10, Bonnievale 6730  
BOTHAVILLE MUNICIPALITY, PO Box 12, Bothaville 9660  
BRACKENFELL MUNICIPALITY, PO Box 35, Brackenfell 7560  
BRAKPAN MUNICIPALITY, PO Box 15, Brakpan 1560  
BRANDFORT MUNISIPALITEIT, Posbus 13, Brandfort 9400  
BREDASDORP MUNICIPALITY, PO Box 51, Bredasdorp 7280  
BRITS MUNICIPALITY, PO Box 106, Brits 0250  
BRONKHORSTSPRUIT MUNISIPALITEIT, Posbus 40, Bronkhorstspuit 1020  
BULTFONTEIN MUNISIPALITEIT, Posbus 3, Bultfontein 9670  
BURGERSDORP MUNICIPALITY, PO Box 3, Burgersdorp 5520

**C**  
CALEDON MUNISIPALITEIT, Posbus 24, Caledon 7230  
CAPE TOWN MUNICIPALITY, PO Box 82, Cape Town 8000  
CARLETONVILLE MUNICIPALITY, PO Box 3, Carletonville 2500  
CARNARVON MUNICIPALITY, PO Box 10, Carnarvon 7060  
CAROLINA MUNICIPALITY, PO Box 24, Carolina 1185  
CERES MUNICIPALITY, PO Box 44, Ceres 6835  
COLIGNY MUNICIPALITY, PO Box 31, Coligny 2725  
CRADOCK MUNICIPALITY, PO Box 24, Cradock 5880

**D**  
DARLING MUNICIPALITY, PO Box 5, Darling 7345  
DE AAR MUNICIPALITY, PO Box 42, De Aar 7000  
DELMAS MUNICIPALITY, PO Box 6, Delmas 2210  
DESPATCH MUNICIPALITY, PO Box 42, Despatch 6220  
DEWETSDORP MUNICIPALITY, PO Box 13, DeWetsdorp 9940  
DIEPMEADOW CITY COUNCIL, PO Box 43278, Industria 2042  
DIV. COUNCIL OF THE CAPE, PO Box 1073, Cape Town 8000  
DORDRECHT MUNISIPALITEIT, Posbus 20, Dordrecht 5435  
DOUGLAS MUNISIPALITEIT, Posbus 27, Douglas 8730  
DUNDEE MUNICIPALITY, PO Box 76, Dundee 3000  
DURBAN MUNICIPALITY, PO Box 147, Durban 4000  
DURBANVILLE MUNICIPALITY, PO Box 100, Durbanville 7550

**E**  
EAST LONDON MUNICIPALITY, PO Box 134, East London 5200  
EDENVALE MUNICIPALITY, PO Box 25, Edenvale 1610  
ELLISRAS MUNISIPALITEIT, Privaatsak X136, Ellisras 0555  
EMPANGENI MUNICIPALITY, Private Bag, Empangeni 3880  
ERMELO MUNICIPALITY, PO Box 48, Ermelo 2350  
ESHOWE MUNICIPALITY, PO Box 37, Eshowe 3815  
ESTCOURT MUNICIPALITY, PO Box 15, Estcourt 3310  
EVANDER MUNICIPALITY, PO Box 55, Evander 2280

**F**  
FICKSBURG MUNISIPALITEIT, Posbus 116, Ficksburg 9730  
FOCHVILLE MUNICIPALITY, PO Box 1, Fochville 2515  
FORT BEAUFORT MUNICIPALITY, PO Box 36, Fort Beaufort 5720  
FRANKFORT MUNISIPALITEIT, Posbus 2, Frankfort 9830  
FRANSCHOEK MUNICIPALITY, PO Box 18, Franschoek 7690

**G**  
GEORGE MUNICIPALITY, PO Box 19, George 6530  
GERMISTON MUNISIPALITEIT, Posbus 145, Germiston 1400  
GLENCOE MUNICIPALITY, PO Box 10, Glencoe 2930  
GOBABIS MUNICIPALITY, PO Box 33, Gobabis 9140  
GONUBIE MUNICIPALITY, PO Box 20, Gonubie 5256  
GORDONS BAY MUNICIPALITY, PO Box 3, Gordons Bay 7150  
GRAAFF-REINET MUNICIPALITY, PO Box 71, Graaff-Reinet 6280  
GRAHAMSTOWN MUNICIPALITY, PO Box 176, Grahamstown 6140  
GREYTOWN MUNICIPALITY, PO Box 71, Greytown 3500

GROOT-BRAKRIVIER MUNISIPALITEIT, Posbus 15, Groot-Brakrivier 6525

**H**  
HARTSWATER MUNISIPALITEIT, Posbus 83, Hartswater 8570  
HEIDELBERG MUNISIPALITEIT, Posbus 201, Heidelberg 2400  
HEILBRON MUNISIPALITEIT, Heilbron 9650  
HENNENMAN MUNISIPALITEIT, Posbus 29, Hennenman 9445  
HERMANUS MUNICIPALITY, PO Box 20, Hermanus 7200  
HOOPSTAD MUNISIPALITEIT, Hoopstad 2670  
HOPETOWN MUNISIPALITEIT, P/Sak X3, Hopetown 8750  
HOWICK MUNICIPALITY, PO Box 5, Howick 3290

**J**  
JAN KEMPDORP MUNISIPALITEIT, Posbus 241, Jan Kempdorp 8550  
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JOUBERTON DORPSRAAD, Posbus 2212, Klerksdorp 2570

**K**  
KAKAMAS MUNICIPALITY, PO Box 174, Kakamas 8870  
KEETMANSHOOP MUNICIPALITY, Private Bag 2125, Keetmanshoop 9020  
KEIMOES MUNISIPALITEIT, Posbus 8, Keimoes 8860  
KEMPTONPARK MUNICIPALITY, PO Box 13, Kempton Park 1620  
KENHARDT MUNICIPALITY, PO Box 15, Kenhardt 8900  
KIMBERLEY MUNICIPALITY, Private Bag X5030, Kimberley 8300  
KINGWILLIAMSTOWN MUNICIPALITY, PO Box 33, Kingwilliamstown 5600  
KINROSS VILLAGE COUNCIL, PO Box 50, Kinross 2270  
KIRKWOOD MUNICIPALITY, The Town Clerk, Kirkwood 6120  
KLERKSDORP MUNISIPALITEIT, Posbus 99, Klerksdorp 2570  
KNYSNA MUNICIPALITY, PO Box 21, Knysna 6570  
KOFFIEFONTEIN MUNISIPALITEIT, Posbus 7, Koffiefontein 9986  
KOKSTAD MUNISIPALITEIT, Posbus 8, Kokstad 4700  
KOMGA MUNICIPALITY, PO Box 21, Komga 4950  
KOPPIES MUNICIPALITY, PO Box 14, Koppies 9540  
KRAAIFONTEIN MUNISIPALITEIT, Posbus 25, Kraaifontein 7570  
KROONSTAD MUNISIPALITEIT, Posbus 302, Kroonstad 9500  
KRUGERSDORP MUNISIPALITEIT, Posbus 94, Krugersdorp 1740  
KURUMAN MUNICIPALITY, PO Box 4, Kuruman 8460  
KPA GEMEENSKAPDIENSTE, P/Sak X7, Goodwood 7460

**L**  
LADYBRAND MUNICIPALITY, PO Box 64, Ladybrand 9745  
LADYSMITH MUNICIPALITY, PO Box 195, Ladysmith 3370  
LICHTENBURG MUNISIPALITEIT, Posbus 7, Lichtenburg 2740  
LYDENBURG MUNICIPALITY, PO Box 61, Lydenburg 1120

**M**  
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MARBLE HALL MUNISIPALITEIT, Posbus 111, Marble Hall 0450  
MARQUARD MUNICIPALITY, Posbus 44, Marquard 4610  
MATATIELE MUNICIPALITY, PO Box 35, Matatiele 4730  
MELMOTH MUNICIPALITY, PO Box 11, Melmoth 3835  
MESSINA STADSRAAD, P/Sak X611, Messina 0900  
MEYERTON MUNISIPALITEIT, Posbus 9, Meyerton 1960

MIDDELBURG MUNISIPALITEIT, Posbus 55, Middelburg 5900  
MIDDELBURG MUNISIPALITEIT, Posbus 14, Middelburg 1050  
MIDRAND MUNICIPALITY, P/Bag X20, Halfway House 1685  
MMABATHO MUNICIPALITY, PO Box 42, Mmabatho 8670  
MONTAGU MUNISIPALITEIT, Posbus 24, Montagu 6720  
MOOI RIVER MUNICIPALITY, PO Box 47, Mooi River 3200  
MOSSIEL BAY MUNICIPALITY, PO Box 25, Mossiel Bay 6500

**N**  
NABOOMSPRUIT MUNISIPALITEIT, P/Sak X340, Naboomspruit 0560  
NELSPRUIT MUNICIPALITY, PO Box 45, Nelspruit 1200  
NEWCASTLE MUNICIPALITY, PO Box 21, Newcastle 2940  
NIGEL MUNICIPALITY, PO Box 23, Nigel 1490  
NYLSTROOM STADSRAAD, P/Sak X1008, Nylstroom 0510

**O**  
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ORKNEY MUNICIPALITY, P/Bag X8, Orkney 2620  
OTJIWARONGO MUNICIPALITY, PO Box 2209, Otjiwarongo, SWA 9210  
OUDTSHOORN MUNISIPALITEIT, Posbus 255, Oudtshoorn 6620

**P**  
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PARYS MUNISIPALITEIT, Posbus 359, Parys 9585  
PHALABORWA MUNICIPALITY, PO Box 67, Phalaborwa 1390  
PIET RETIEF MUNISIPALITEIT, Posbus 23, Piet Retief 2380  
PIETERMARITZBURG MUNICIPALITY, PO Box 321, Pietermaritzburg 3200  
PIETERSBURG MUNISIPALITEIT, Posbus 111, Pietersburg 0700  
PIKETBERG MUNICIPALITY, The Town Clerk, Picketberg 7320  
PLETTENBERGBAAI MUNISIPALITEIT, Posbus 26, Plettenbergbaai 6600  
PORT ALFRED MUNICIPALITY, PO Box 13, Port Alfred 6170  
PORT ELIZABETH MUNICIPALITY, PO Box 116, Port Elizabeth 6000  
PORT SHEPSTONE MUNICIPALITY, PO Box 5, Port Shepstone 4240  
POSTMASBURG MUNISIPALITEIT, Posbus 5, Postmasburg 8420  
POTCHEFSTROOM MUNISIPALITEIT, Posbus 113, Potchefstroom 2520  
POTGIETERSRUS MUNISIPALITEIT, Posbus 34, Potgietersrus 0600  
PRETORIA MUNISIPALITEIT, Posbus 440, Pretoria 0001  
PRIESKA MUNISIPALITEIT, Posbus 16, Prieska 8940

**Q**  
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**R**  
RAAD OP PLAASLIKE BESTUURSAANGELEENTHEDE, Posbus 1341, Pretoria 0001  
RANDBURG MUNICIPALITY, P/Bag X1, Randburg 2125  
RANDFONTEIN MUNISIPALITEIT, Posbus 139, Randfontein 1760  
REITZ MUNISIPALITEIT, Posbus 26, Reitz 9810  
RICHARDSBAY MUNICIPALITY, P/Bag, Richardsbay 3900  
RIEBECKSTAD MUNISIPALITEIT, Posbus 6306, Riebeeckstad 9469  
RIVERSDALE MUNICIPALITY, PO Box 29, Riversdale 6770  
ROBERTSON MUNICIPALITY, PO Box 52, Robertson 6705  
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RUSTENBURG MUNISIPALITEIT, Posbus 16, Rustenburg 0300

**S**  
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SASOLBURG MUNISIPALITEIT, Posbus 60, Sasolburg 9570  
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SOMERSET WEST MUNICIPALITY, PO Box 19, Somersset West 7130  
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SPRINGS MUNISIPALITEIT, Posbus 45, Springs 1560  
STANDERTON MUNISIPALITEIT, Posbus 66, Standerton 2430  
STANGER MUNICIPALITY, PO Box 72, Stanger 4450  
STELLENBOSCH MUNISIPALITEIT, Posbus 17, Stellenbosch 7600  
STILFONTEIN MUNISIPALITEIT, Posbus 20, Stilfontein 2550  
STRAND MUNISIPALITEIT, Posbus 3, Strand 7140  
STREEKDJENSTERAAD, HOËVELDGEBIED, Posbus 520, Witbank 1035  
STREEKDJENSTERAAD, NOORD-KAAP, P/Sak X5005, Kimberley 8300  
STREEKDJENSTERAAD, OOS-KAAP, Posbus 14025, Sidwell 6061  
STREEKDJENSTERAAD, OOS-TRANSVAAL, Posbus 888, Nelspruit 1200  
STREEKDJENSTERAAD, WES-KAAP, P/Sak X7, Goodwood 7460  
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STUTTERHEIM MUNICIPALITY, PO Box 2, Stutterheim 4930  
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SWELLENLAMP MUNISIPALITEIT, Posbus 20, Swellendam 6740

**T**  
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THABA NCHU MUNICIPALITY, PO Box 22, Thaba Nchu 9780  
TONGAAT MUNICIPALITY, PO Box 33, Tongaat 4400  
TRANSEKI ELECTRICITY SUPPLY CORPORATION, PO Box 965, Umtata Transkei  
TZANEEN MUNISIPALITEIT, Posbus 24, Tzaneen 0850

**U**  
UITENHAGE MUNISIPALITEIT, Posbus 45, Uitenhage 6230  
UMTATA MUNICIPALITY, PO Box 57, Umtata 5100

UPINGTON MUNISIPALITEIT, Privaatsak X6003, Upington 8800

**V**  
VANDERBIJLPARK MUNISIPALITEIT, Posbus 3, Vanderbijlpark 1900  
VELDDRIF MUNICIPALITY, PO Box 29, Velddrif 7365  
VENTERSDORP TOWN COUNCIL, PO Box 15, Ventersdorp 2710  
VEREENIGING MUNISIPALITEIT, Posbus 35, Vereeniging 1930  
VERWOERDBURG MUNISIPALITEIT, Posbus 14013, Verwoerdburg 0140  
VILJOENSKROON MUNISIPALITEIT, Posbus 37, Viljoenskroon 9520  
VIRGINIA MUNISIPALITEIT, Posbus 156, Virginia 9430  
VOLKSRUST MUNISIPALITEIT, P/Sak X9011, Volksrust 2470  
VREDE MUNISIPALITEIT, Posbus 155, Vrede 2455  
VREDENBURG-SALDANHA MUNISIPALITEIT, P/Sak X12, Vredenburg 7380  
VREDENDAL MUNISIPALITEIT, Die Stadsklerk, Vredendal 8160  
VRYBURG MUNISIPALITEIT, Posbus 35, Vryburg 8600  
VRYHEID MUNISIPALITEIT, Posbus 57, Vryheid 3100

**W**  
WALVISBAAI MUNISIPALITEIT, Privaatsak 5017, Walvisbaai 9190  
WARMBAD MUNISIPALITEIT, Posbus 48, Warmbad 0480  
WARRENTON MUNICIPALITY, PO Box 10, Warrenton 8530  
WELKOM MUNISIPALITEIT, Posbus 708, Welkom 9460  
WELLINGTON MUNICIPALITY, PO Box 12, Wellington 7655  
WEPENER MUNISIPALITEIT, Posbus 31, Wepener 9944  
WESSELSBRON MUNISIPALITEIT, Posbus 6, Wesselsbron 9860  
WESTONARIA MUNICIPALITY, PO Box 19, Westonaria 1780  
WINBURG MUNISIPALITEIT, Posbus 26, Winburg 9420  
WINDHOEK MUNISIPALITEIT, Posbus 5011, Windhoek 9000  
WITRIVIER MUNISIPALITEIT, Posbus 2, Witrivier 1240  
WITBANK MUNISIPALITEIT, Posbus 3, Witbank 1035  
WORCESTER MUNISIPALITEIT, Privaatsak X3046, Worcester 6850

**Z**  
ZASTRON MUNISIPALITEIT, Zastron 9950

#### AMEU AFFILIATE MEMBERS/ VMEQ GEAFFILIEERDE LEDE

**A**  
3M SOUTH AFRICA: Keith Wilson, PO Box 10465, Johannesburg 2000 (011) 922-2397  
A JACKSON CONSULTING ENG: PO Box 4814, Cape Town 8000 (021) 689-2029  
ABERDARE CABLES AFRICA LTD: T van Niekerk, PO Box 2566, Edendale 1610 (011) 609-4020  
ABERDARE POWER CABLES: J Irwin, PO Box 188, Pietermaritzburg 3200 (0331) 61331  
ADAMS & FROST CONSULTANTS cc: D. Frost, PO Box 13037, Vincent, East London 5217 (0431) 43-8266  
AECI LIMITED: D.J. Pitfield, PO Box 1122, Johannesburg 2000 (011) 233-1794  
AEG (PTY) LTD: Herman Brosch, PO Box 10264, Johannesburg 2000 (011) 806-2040  
AFRICAN CABLES LTD: Keith Bull, PO Box 172, Vereeniging 1930 (016) 4-5821  
AFRICAN ELECTRIC (PTY) LTD: Phillip Tolmay, PO Box 14040, Wadeville 1407 (011) 827-5425  
AIRSHRINK PRODUCTS CC: Rob Melville, PO Box 447, Maraisburg 1700 (011) 472-1533

ALCOM SYSTEMS (PTY) LTD: Mario Scalco, PO Box 39586, Bramley 2018 (011) 887-0900  
ALUEX (PTY) LTD: J A Botha, PO Box 3135, Middelburg 1050 (0132) 46-1741  
ALUSAF (PTY) LTD: A Malan, PO Box 284, Empangeni 3880 (0351) 5-1111  
ANGCON TECHNOLOGIES (PTY) LTD: R P Coetzee, PO Box 1490, Dassenburg 7350 (0226) 7-2140  
ANODE ELECT ENG & CON CO: Henry Barnard, PO Box 673, Brakpan 1540 (011) 55-8370/1  
ASH BROTHERS (PTY) LTD: T Kloppers, PO Box 6061, Johannesburg 2000 (011) 493-5340  
ATC (PTY) LTD: K Leaper, PO Box 663, Brits 0250 (01211) 2-0071

**B**  
BBT POWER TRANSFORMERS: J Coetzee, PO Box 691, Pretoria 0001 (012) 79-7020  
BBT POWER SYSTEMS: N Nel, PO Box 1530, Bedfordview 2008 (011) 455-3010

BBT DISTRIBUTION: R Neale, PO Box 911 – 701, Rosslyn 0200 (012) 541-1350  
BALLENDEEN & ROBB: D A Robb, PO Box 78734, Sandton 2146 (011) 783-1038  
BEKA (PTY) LTD: Johann Schleritzko, PO Box 120, Olifantsfontein 1665 (012) 61-1552  
BERNARD DUDLEY ELECTR. DISTR. COMM: Bernard Dudley, PO Box 473, Constanza 7848 (021) 88-6003/6  
BIDERMAN, FINN, BEEKHUIZEN & ASS: P vd Westhuizen, PO Box 1351, Cape Town 8000 (021) 24-3177  
BROOKE PATRICK (PTY) LTD: H Gow (Mrs), PO Box 422, Bedfordview 2008 (011) 455-2900  
BOOYSENS & KOORN LTD: J A H vd Walt, Posbus 48550, Roosevelt Park 2129 (011) 888-1425/6  
BOUWER VILJOEN INC: Koos Gertenbach, PO Box 1155, Upington 8800 (0541) 5481  
BOWTHORPE-HELLERMAN: Neville Clarke, PO Box 27063, Benrose 2011 (011) 616-1960  
BRIAN COLQUHOUN: H. Lister, PO Box 31757, Braamfontein 2017 (011) 339-4376

**C**  
CAHI DE VRIES & BRINK: A van den Bergh, PO Box 27658, Sunnyside 0132 (012) 343-0236  
CAHI DE VRIES & BRINK: Koos Myburgh, PO Box 1079, Bloemfontein 9300 (051) 7-8081  
CEGELEC (PTY) LTD: EJ Stenvet, PO Box 8023, Elandsfontein 1406 (011) 974-5201  
C H I CONTROL LTD: Horst Bier, PO Box 14089, Wadeville 1422 (011) 827-9124  
CIRCUIT BREAKER INDUSTRIES: Terry Grills, PO Box 881, Johannesburg 2000 (011) 974-7033  
CLINKSCALES, MAUGHAN, BROWN & PART: Paul Scales, PO Box 196, Port Elizabeth 6000  
CLINKSCALES, MAUGHAN BROWN & PART: B R Hadfield, PO Box 570, Cape Town 8000 (021) 24-4133  
CONELECTRIC cc: M L J Grobler, PO Box 178, Maraisburg 1700 (011) 674-1826  
CONNESCO cc: B Wethmar, PO Box 12468, Benony 1504 (011) 917-2730  
CONTROL LOGIC (PTY) LTD: H A Bos, PO Box 2332, Durban 4000 (031) 29-5222  
D J J CONRADIE & PARTNERS: G J Krause, PO Box 17031, Groenkloof 0027 (012) 323-1755  
CONRADIE & VENTER: C L Meintjes, PO Box 1009, Bloemfontein 9300 (051) 47-1636  
J A CRABTREE (PTY) LTD: B Rogers, PO Box 413, Springs 1560 (011) 813-4130  
CROMPTON PARKINSON SA (PTY) LTD: R G H Wiseman, PO Box 1513, Southdale 2135 (011) 680-3400  
CU AL ENGINEERING: M E Walsh, PO Box 18228, Dalbridge 4014 (031) 21-0285  
CULLINAN ELECTRICAL: Dave Smith, P/Bag 18, Olifantsfontein 1665 (011) 316-3636  
CUSTOM TOOLING (PTY) LTD: Tom Hoskin, PO Box 192, Kempton Park 1620 (011) 394-2020

**D**  
DE VILLIERS & MOORE: Abe de Villiers, PO Box 472, Durbanville 7550 (021) 96-3087  
DECALIGHT: J C Prichett, PO Box 258, Paarden Eiland 7420 (021) 51-7076  
DEVELOPMENT BANK OF SA: W S Naude, PO Box 195, Rant en Dal 1751 (011) 445-2447  
DIGITAL DATA SYSTEM cc: G Hainke-Hentschel, PO Box 35872, Northcliff 2115 (011) 793-1151  
DISTRIBUTION COMPONENTS cc: Chris Nash, PO Box 1396, Randburg 2125 (011) 792-2705  
DREWETT HUBBLE & POKORNY ING: Avram Pelunsky, PO Box 47270, Parklands 2121 (011) 789-4047  
DREWETT HUBBLE & POKORNY ING: Simon Lechtman, PO Box 1815, Welkom 9460 (0171) 72763  
DU TOIT & VAN DER VYVER: M van Alphen, Posbus 2917, Kaapstad 8000 (021) 24-8137/8  
C A DU TOIT & VENNOTE: G D Jordaen, Posbus 4256, Pretoria 0001 (012) 322-8931

C A DU TOIT & PARTNERS: Henk Turkstra, PO Box 2509, Cape Town 8000 (021) 23-7220  
DUNCANSBY (PTY) LTD: John T Grundy, PO Box 10508, Strubenvale 1570 (011) 56-8385

**E**  
EBERHARDT-MARTIN (PTY) LTD: Roger Martin, PO Box 85027, Emmarentia 2029 (011) 673-2036  
ELECTRICAL CONTRACTORS ASS. OF SA (EAC): Bernard Kneale, PO Box 33367, Jeppestown 2043 (011) 614-1112/3  
ELECTRICAL MOULDED: A G Daus, PO Box 872, Honeydew 2040 (011) 793-1264  
ELECTRICAL PROTECTION CO. (PTY) LTD: Dave Rees, PO Box 14633, Wadeville 1422 (011) 827-5912  
ELECTRO NETWORK (PTY) LTD: P Blewitt, PO Box 57458, Springfield 2137 (011) 839-3270  
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ELVEN INTERNATIONAL DIST.: P Wainstein, PO Box 8082, Johannesburg 2000 (011) 614-6541  
ERENCO POWER (PTY) LTD: L J Ward, PO Box 32102, Braamfontein 2017 (011) 403-5941  
ESKOM (WESTERN CAPE REGION): W H Holtz, PO Box 2100, Bellville 7535 (021) 915-9111  
EVERETT & GERMISHUIZEN INC: J C Germishuizen, PO Box 1369, Randburg 2125 (011) 789-2313

**F**  
F.D.H. PRODUCTS: F D Hickman, PO Box 10263, Ashwood 3605 (031) 700-2491  
FARAD (PTY) LTD: G Gerber, PO Box 31220, Braamfontein 2017 (011) 646-4446  
FERREIRA & DELPORT: Cloete Delport, PO Box 28985, Sunnyside 0132 (012) 26-0803

**G**  
GARDNER & CARPENTER: D Gardner, 278 Oxford St., East London 5200 (0431) 23690  
GEC ELECTRICAL PRODUCTS Co: Alf Searle, PO Box 13004, Knights 1413 (011) 826-6647  
GEC DISTRIBUTION EQUIPMENT Co: John Parker, P/Bag X1059, Germiston 1400 (011) 51-7871  
GEC TRANSFORMER Co: R Wallis, PO Box 13024, Knights 1413 (011) 826-6647  
GEC LIGHTING Co: Cedric Hemmings, PO Box 25696, Denver 2027 (011) 873-2500  
GEC MEASUREMENTS Co: R Dismore, PO Box 39146, Bramley 2018 (011) 887-1800  
GEC ELECTRICAL PROJECTS Co: S A Keightley, P/Bag 1, Bramley 2018 (011) 887-1800  
GEC SWITCHGEAR Co: W Lashley, PO Box 13024, Knights 1413 (011) 826-6647  
GENWEST INDUSTRIES (PTY) LTD: John Pike, PO Box 5031, Benoni South 1502 (011) 52-8111  
GOLNIX cc: C J Vermaak, PO Box 342, Bellville 7530 (021) 951-2165  
G S FAINSINGER & ASSOCIATES: H Weitzel, PO Box 2142, Windhoek SWA 9000 (061) 33-5165

**H**  
H V TEST cc: Ron Goodwin, PO Box 651287, Benmore 2010 (011) 883-2149  
HAWKER-SIDDELEY AFRICA: John Williams, PO Box 9159, Elsburg 1407 (011) 827-3458  
HILL KAPLAN SCOTT INC.: Trevor Gaunt, PO Box 3965, Cape Town 8000 (021) 23-7050  
HULETT ALUMINIUM LTD: F C Montgomery, PO Box 25, Olifantsfontein 1665 (012) 61-2641

**I**  
INDUSTRIAL POLES & MASTS cc: Eben Henning, PO Box 547, Alberton 1450 (011) 864-2680  
INTERSWITCH (PTY) LTD: Dieter Korner, PO Box 11048, Johannesburg 2000 (011) 673-6556  
INSULATOR INDUSTRIES cc: L Pienaar, PO Box 258, Benoni 1500 (011) 845-1910



**J**

J J ANDERSSSEN RAADGEWENDE INGENIEURS: J J R Anderssen, PO Box 1197, Cape Town 8000 (021) 96-7261  
 JACO WASSERFALL & VENNOTE: J Wasserfall, Posbus 44706, Vanderbijlpark 1900 (016) 81-0165  
 JAMES CROWELL & PARTNERS: V A Raynal, PO Box 480, Rivonia 2128 (011) 726-2328  
 JOHN L KENYON SUPPLIERS: J L Kenyon, PO Box 11101, Dorpspruit PMBurg 3206 (0331) 51488

**K**

KARL PFISTERER (SA) PTY LTD: Richard Jones, PO Box 6530, Dunswart 1508 (011) 894-6756  
 KENNEDY & DONKIN AFRICA (PTY) LTD: R J Moon, PO Box 4358, Randburg 2125 (011) 880-6420/3  
 K P L E.TSA (PTY) LTD: Frank Wheeler, PO Box 6869, Johannesburg 2000 (011) 615-6433  
 KLOCKNER-MOELER (SA) PTY LTD: Ray Hudson, PO Box 100, Kempton Park 1620 (011) 975-3937  
 KWANDEBELE NAT DEV CORP LTD: A J van Wyk, PO Box 1300, Bronkhorstspuit 1020 (01212) 3421  
 KWAZULU FINANCE & INVESTMENT CORPORATION LTD: B Luus, PO Box 681, Ladysmith 3370 (0361) 34-1415  
 KWIKOT LTD: Peter Nash, PO Box 1016, Benoni 1500 (011) 892-2030

**L**

LARRY BARNETT INTERNATIONAL (PTY) LTD: Larry Barnett, PO Box 166, Johannesburg 2000 (011) 824-1210  
 LIEBENBERG & STANDER: MECHANICAL & ELECTRICAL: K Gafner, PO Box 2618, Cape Town 8000 (021) 23-5101  
 LINEGEAR 2000: Geoff Auton, PO Box 782625, Sandton 2146 (011) 883-7080  
 LUMEX (PTY) LTD: D Woodin, PO Box 39045, Bramley 2018 (011) 786-8420

**M**

G H MARAIS & VENNOTE: W Seymour, Posbus 1789, Pretoria 0001 (012) 663-1296/7  
 MERLIN GERIN ELECTRIC (PTY) LTD: E Retief, PO Box 6090, Dunswart 1508 (011) 892-1001  
 MERZ & McLELLAN (SA): Angus McFarlane, PO Box 31012, Braamfontein 2017 (011) 339-5754  
 MIDLAND EQUIPMENT (PTY) LTD: R K Kneale, PO Box 440, Kempton Park 1620 (011) 975-5941

**N**

NETPLAN CONSULTING ENG.: J W du Preez, PO Box 2792, Nelspruit 1200 (01311) 53857/8  
 NIENABER & VAN DER WALT: Posbus 1639, Rivonia 2128  
 NORDLAND (PTY) LTD: Cyril Nunn, PO Box 522, Muldersdrif 1747 (011) 957-2003  
 NORTH & ROBERTSON: M T Tregurtha, PO Box 194, Paarden Eiland 7420 (021) 52-6050

**O**

OGATIN (PTY) LTD: M D Hanck, PO Box 514, Roodepoort, 1725 (011) 762-5581  
 OLEN & FOSTER: M S Foster, 710 Nedbank Ctr, Strand Street, Cape Town 8001 (021) 24-0020  
 OSCAR COMPUTER TECHNOLOGIES (PTY) LTD: Alex Nortjé, PO Box 752, Randburg 2123 (011) 789-1203  
 OVE ARUP & PARTNERS: A D Bell, PO Box 47012, Parklands 2121 (011) 880-1715

**P**

W J PELSNER: Willem Pelsner, PO Box 5372, Mmabatho 8681 (01401) 22262  
 PIENAAR & ERWEE: J Erwee, Posbus 27598, Sunnyside 0132 (012) 46-6297/8  
 PLANTECH ASSOCIATE INC.: Hein Schuld, PO Box 20206, Alkantrant 0005 (012) 348-8643  
 POWER ENGINEERS (PTY) LTD: Errol Kotze, PO Box 44, Eppindust 7475 (021) 54-2681  
 POWER INSTALLATIONS (PTY) LTD: S W Freeborn, PO Box 11655, Randhart 1457 (011) 864-1692

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 PREFORMED LINE PRODUCTS: D Kambouris, P.O Box 958, Pietermaritzburg 3200 (0331) 7-1520  
 PROGRAMMING SKILLS (PTY) LTD: J D van Niekerk, PO Box 4137, Randburg 2125 (011) 782-6454  
 PROTECTIVE SWITCHGEAR: R F Hofmeester, PO Box 14718, Wadeville 1422 (011) 827-5705

**R**

REPUBLIC POWER & COMMUNICATION CO (PTY) LTD: J G Vorster, PO Box 2357, Halfway House 1685 (021) 315-1334  
 REYROLLE SWITCHGEAR LTD: W Tindle, PO Box 8080, Elandsfontein 1406 (011) 974-2866  
 REYROLLE SWITCHGEAR LTD. IND. ACC. DIV.: B Madeley, PO Box 78-3208, Sandton 2146 (011) 802-7210 fax 804-3496  
 ROBERTSON F H & ASSOCIATES: F H Robertson, PO Box 542, George 6530 (0441) 74-2144  
 ROBMET (PTY) LTD: I W Robinson, PO Box 698, Bedfordview 2008 (011) 455-3350  
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 RON SLATEM & ASSOCIATES: R R Slatem, PO Box 67452, Bryanston 2021 (011) 706-2737

**S**

SA PVC CABLES: K McArthur, PO Box 5093, Johannesburg 2000 (011) 618-3900  
 SABC: P Fraser, P/Bag X1, Auckland Park 2006 (011) 714-3500  
 SHEPSTONE-KRAUSE CC: N Shepstone, 76 Valleyview Rd, Morningside, Durban (031) 303-1361  
 SIEMENS SA (PTY) LTD: R van Ark, PO Box 4583, Johannesburg 2000 (011) 407-4111  
 SIGMAFORM SA (PTY) LTD: Raymond Foxcroft, PO Box 32, Maraisburg 1700 (011) 674-1240  
 SPRECHER & SCHUH (PTY) LTD: Peter Smith, PO Box 61506, Marshalltown 2107 (011) 493-5022  
 STANDARD TELEPHONES & CABLES: I D Smith, PO Box 286, Boksburg 1460 (011) 899-6035  
 SWITCHBOARD MANUFACTURERS: J Almeida, PO Box 40086, Red Hill 4071 (031) 507-7311  
 SYSTOL (PTY) LTD: Adolf Fourie, PO Box 134, Olifantsfontein 1665 (012) 61-1628

**T**

TECHNIKON PRETORIA SKOOL VIR ELEKTRIESE INGENIEURSWESE: D F Bisschoff, Kerkstr-Oos 420, Pretoria 0002 (012) 318-5155  
 THE FIBRE GLASS SHOP: Hilton Dalbock, PO Box 7166, East London 5200 (0431) 46-1287  
 THE LOUIS WILSENACH GROUP: Glanis Rennie, PO Box 16409, Doornfontein 2028 (011) 402-2720  
 THERMOTEC DEVELOPMENT (PTY) LTD: L Gill (Mrs), PO Box 451, Silvertown 0127 (012) 86-3772  
 THORN LIGHTING SA (PTY) LTD: M A Richards, PO Box 43075, Industria 2042 (011) 673-4308  
 THREE-D AGENCIES (PTY) LTD: B O'Leary, PO Box 1858, Southdale 2135 (011) 433-3808/9  
 TRANSCOM COMMUNICATIONS (PTY) LTD: Robin Frew, PO Box 12438, Cloorkop 1725 (011) 393-1222  
 TUBEWRIGHTS (PTY) LTD: Frik Liebenberg, PO Box 2358, Vereeniging 1930 (016) 4-5133

**U**

UNIESTAALKORPORASIE SA BPK: Peet de Villiers, Posbus 48, Vereeniging 1930 (016) 4-5122

**V**

VVAALCOR cc: Terry Young, PO Box 920, Edenvale 1610 (011) 452-3240  
 VAN HEERDEN J S: Carelsberg 238, Erasmusrand 0181 (012) 45-2128  
 J D VAN NIEKERK & GENOTE: Dirk van Niekerk, Posbus 50645, Randburg 2125 (011) 782-6493  
 VAN NIEKERK KLEY & EDWARDS: B K Frow, PO Box 72927, Lynnwood Ridge 0040 (012) 803-7930

VECTOR: David Gilbert, PO Box 8147, Johannesburg 2000 (011) 835-2221

VORSTER VD WESTHUIZEN EN VENNOTE: Johan Venter, Posbus 398, Loevenstein, Bellville 7530 (021) 953-2080

#### W

WACO DISTRIBUTORS: Ken Buckton, PO Box 461, Johannesburg 2000 (011) 29-7561

WATSON, EDWARDS & VD SPUY: A E Sharpe, PO Box 783569, Sandton 2146 (011) 883-1701

WEYERS BOTHA & HUBEE: Koos Weyers, PO Box 7100, Hennopsmeer 0046 (012) 667-1021

#### Y

YELLAND ENGINEERING (PTY) LTD: H J Yelland, PO Box 10993, Johannesburg 2000 (011) 832-2061

YORK ENCLOSURES (PTY) LTD: K Heering (Mrs), PO Box 27224, Benrose 2011 (011) 618-3780/1

YORKSHIRE SWITCHGEAR (SA) (PTY) LTD: R Wearne, PO Box 1419, Bedfordview 2008 (011) 873-4602

#### Z

ZAI NATAL INC: M D Claassen, PO Box 3540, Durban 4000 (031) 23-8201

ZUMTOBEL-BARLITE (PTY) LTD: P A Davies, PO Box 2421, Alberton 1450 (011) 907-1640

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### PAST MEMBERS — VOORMALIGE LEDE

#### A

ATTERIDGE WH: PO Box 369, Port Elizabeth 6000

#### B

BAILEY RV: PO Box 639, Stanger 4450

BARRIE JJ: 82 First Avenue, Dunvegan, Edenvale 1610

BOBEK KH: 63 Westville Road, Westville 3630

BOYACK IF: 44-15th Street, Menlo Park 0081

BRUMMER JG: Posbus 17, Stellenbosch 7600

BURTON CR: 54 Memorial Road, Kimberley 8301

#### C

CAMPBELL AR: PO Box 3, Impendhele 4545

CLARE C: 2 Verona Court, 196 Innes Road, Durban 4001

CLINTON JS: PO Box 4648, Johannesburg 2000

CONRADIE DJR: Posbus 1009, Bloemfontein 9300

CRONJE WJ: Wenningstraat 37, Groenkloof, Pretoria 0181

#### D

DAWSON C: Electricity Supply Commission, PO Box 2408, Durban 4000

DE VILLIERS AP: PO Box 603, Hermanus 7200

DE VILLIERS EE: Elangeni w/s 202, Cantonmentsweg 146, Lyttelton, Verwoerdburg 0157

DREYER MC: Kommissarisstraat 107, Welgemoed 7530

DUNSTAN RS: PO Box 15024, Emerald Hill, Port Elizabeth 6001

#### F

FRENCH EM: 9 Harding Street, Greytown 3500

FUTCHER L: 170 Otter Street, East Park, Kempton Park 1620

#### G

GAMBLE JS: 114 Formosa Garden Village, PO Box 416, Plettenberg Bay 6600

GILMOUR RR: 21 Herry de Stadler, Close Fish Hoek 7975

#### H

HALLIDAY K: PO Box 5, Port Shepstone 4240

HARVEY PH: PO Box 581, Greytown 3500

HEASMAN GG: PO Box 77, Fort Victoria, Harare

HILL DR: 23 St Andrewsstr, Durban North 4057

HONNIBALL GT: PO Box 17031, Groenkloof 0027

#### L

LIEBENBERG SJ: Posbus 98, Pretoria 0001

#### M

MOGOWAN JM: (Chairman) The Standard Bank, PO Box 373, Harare, Zimbabwe

McGIBBON J: PO Box 47, Doonside, Natal 2500

McINTYRE HA: 95 Gen Hertzog Road, Three Rivers, Vereeniging 1930

MOLE EW: PO Box 39663, Bramley 2018

McWILLIAM EA: 202 Nicholson Street, Brooklyn, Pretoria 0181

#### P

POTGIETER NA: Webbstraat 1211, Queenswood, Pretoria 0186

PSOTTA KU: Malherbestraat 9, Upington 8800

#### R

RATTEY WP: 50 Neethling Street, Strand 7140

REICHERT W: P/a Universiteitsingenieur, Universiteit van Kaapstad, Privaatsak, Rondebosch 7700

ROSSLER A: 53 Azalea Gardens, 391 Alexandra Road, Pietermaritzburg 3201

#### S

SCHREUDER TP: PO Box 591, Vredendal 8160

SCHOLES EH: 20 Gavin Avenue, Pine Park 5194

#### T

THERON TA: Posbus 156, Badplaas 1190

#### V

VAN DER MERWE FJ: Posbus 1111, Carletonville 2500

#### W

WILLIAMS JT: PO Box 1617, Pretoria 0001

WEAKLY SL: 41 Hospital Street, Cradock 5880

WYLIE RJS: PO Box 217, Germiston 1400

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### HONORARY MEMBERS — ERELEDE

#### 1915 - 1936

DR HJ VAN DER BIJL — Electricity Supply Commission

J ROBERTS — Durban

E POOLE — Secretary/Sekretaris

#### 1938

LL HORRELL — Pretoria

#### 1944

GH SWINGLER — Cape Town

#### 1945

AT RODWELL — Johannesburg

#### 1950

DR JH DOBSON — Johannesburg

#### 1951

HA ESATMAN — Cape Town

#### 1955

W BELLAD-ELLIS — East London

JC FRASER — Johannesburg

C KINSMAN — Durban

#### 1956

WH MILTON — Electricity Supply Commission

A MORTON JAFFRAY — Salisbury  
Major SG REDMAN — Merz & McLellan, Johannesburg  
Clr. CEK YOUNG — Pietermaritzburg

1957  
DA BRADLEY — Port Elizabeth

1958  
Col. EG EWER — Pietermaritzburg  
A FODEN — East London  
CR HALLE — Pietermaritzburg

1960  
Clr. FJ CASTELYN — Bloemfontein  
Clr. LP DAVIES — Springs

1962  
SR SIMPSON — Bulawayo  
JL VAN DER WALT — Vereeniging

1963  
CG DOWNIE — Cape Town  
JC DOWNEY — Springs  
RL KANE — Johannesburg

1965  
GJ MULLER — Bloemfontein

1967  
Clr. JD MARAIS — Johannesburg  
JR TELLES — Lourenco Marques

1969  
W BEESLEY — Estcourt  
PA GILES — East London  
D MURRAY-HOBBS — Port Elizabeth  
EL SMITH — Boksburg

1971  
D HUGO — Pretoria  
ACT FRANTZ — Cape Town  
HT TURNER — Umlati  
R LEISHMAN — Johannesburg  
RMO SIMPSON — Durban  
W ROSSLER — Pretoria  
F STEVENS — Durban  
JF LATEGAN — Stellenbosch

1973  
RG EWING — Past Secretary

1975  
Clr. HG KIPLING — East London  
C LOMBARD — Germiston  
DC PLOWDEN — Johannesburg  
JG WANNENBURG — Chief Inspector of Factories

1977  
Dr. RL STRASZACKER — Electricity Supply Commission  
AA MIDDLECOTE — Fish Hoek  
GC THERON — Vanderbijlpark  
AC WADDY — Pietermaritzburg

1979  
RW BARTON — Welkom  
Clr. HJ HUGO — Roodepoort

1981  
JD VAN WYK — CSIR  
Dr. RB ANDERSON — CSIR  
JOHN MORRISON — Affiliate

1983  
TC MARSH — Affiliate  
JK VON AHLFTEN — Springs

1985  
AA WEICH — Chief Inspector Occupational Safety  
KG ROBSON — Esat London  
Clr. RL DE LANGE — East London  
E DE C PRATORIUS — Potchefstroom  
W BARNARD — Johannesburg

1987  
AP BURGER — Pretoria  
JD DAWSON — Uitenhage  
DH FRASER — Durban  
DC PALSER — Cape Town

1989  
PJ BOTES — Roodepoort  
MPP CLARKE — Randburg  
EG DAVIES — Pietermaritzburg  
JA LOUBSER — Benoni

#### PAST PRESIDENTS — VOORMALIGE PRESIDENTE

1915-17	*JH Dobson	Johannesburg	1952-53	*AR Sibson	Zimbabwe (Bulawayo)
1917-19	*J Roberts	Durban	1953-54	*JC Fraser	Johannesburg
1919-20	*B Sankey	Port Elizabeth	1954-55	GJ Muller	Bloemfontein
1920-22	*TCW Dodd	Pretoria	1955-56	*DJ Hugo	Pretoria
1922-24	*GH Swingle	Cape Town	1956-57	*JE Mitchell	Zimbabwe (Harare)
1924-26	*J Roberts	Durban	1957-58	*JL van der Walt	Krugersdorp
1926-27	*B Sankey	Johannesburg	1958-59	CG Downie	Cape Town
1927-29	*JM Lambe	East London	1959-60	*RW Kane	Johannesburg
1929-31	*R Macaulay	Bloemfontein	1960-61	RMO Simpson	Durban
1931-33	*LL Horrell	Pretoria	1961-62	C Lombard	Germiston
1933-34	*LF Bickell	Port Elizabeth	1962-63	*PA Giles	East London
1935-36	*GG Ewer	Pietermaritzburg	1963-64	JC Downey	Springs
1936-37	*A Rodwell	Johannesburg	1964-65	RW Barton	Welkom
1937-38	*JH Gyles	Durban	1965-67	*D Murray-Nobbs	Port Elizabeth
1938-39	*HA Eastman	Cape Town	1967-69	GC Theron	Vanderbijlpark
1939-44	*IJ Nicholas	Umtata	1969-71	HT Turner	Umtali
1944-45	*A Rodwell	Johannesburg	1971-73	JK von Ahlften	Springs
1945-46	JS Clinton	Zimbabwe (Harare)	1973-75	JC Waddy	Pietermaritzburg
	*JW Phillips	Zimbabwe (Bulawayo)	1975-77	E de C Pretorius	Potchefstroom
1946-47	GJ Muller	Bloemfontein	1977-79	KG Robson	East London
1947-48	C Kinsman	Durban	1979-81	PJ Botes	Roodepoort
1948-49	*A Foden	East London	1981-83	DH Fraser	Durban
1949-50	DA Bradley	Port Elizabeth	1983-85	W Barnard	Johannesburg
1950-51	CR Hallé	Pietermaritzburg	1985-87	JA Loubser	Benoni
1951-52	JC Downey	Springs	1987-89	AHL Fortmann	Boksburg

\* Deceased/Overlede.

## THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS (SOUTH AFRICA AND RHODESIA)

Engineer Members, Councillor Members and Visitors at 18th Convention  
Johannesburg, 24th to 27th April, 1944



Front Row (sitting left to right): L.L. Horrell (Secretary and Treasurer); Councillor (Major) G.L. Cooke, Mafeking; D. Ritson, Stellenbosch; G.E.H. Jones, Mafeking; W. Mortimer Mail, Kokstad; W.H. Milton, Johannesburg; J.C. Fraser (Member of Council), Johannesburg; H.A. Eastman (Past President), Cape Town; A.T. Rodwell (President), Johannesburg; J. Houston Angus, Port Elizabeth; Councillor C. Olley (Member of Council), Salisbury; G.R.E. Wright (Member of Council), Benoni; C. Kinsman (Member of Council), Durban; A.Q. Harvey, Springs; A. Foden, East London; Colonel G.G. Ewer, Johannesburg; W. Houreid, Randfontein; W. Powell, Bloemfontein.

Second Row: C.R. Vickers, Boksburg; W.J. Sellers, Boksburg; C.L.R. Quick, Ladysmith; F. Stevens, Ladysmith; D.H. Adams, Oudtshoorn; Councillor D.E. Ellis, Nigel; H. Bickley, Nigel; Councillor W. Dickenson, Port Alfred; Councillor A.W. Worrall, East London; M.R. Bevington, Middelburg, C.P.; Councillor A. Hadlow, Salisbury; Councillor E.K. Evans, Umtali; S.T. Veldman, Vryburg; A. Elliott, Uitenhage; J.W. Lea, Port Elizabeth; Councillor K.P. van Dyk, Piet Retief.

Third Row: Councillor M. Toomey, Roodepoort; H.L. Groom, Roodepoort; C.E. Gregor, Standerton; Councillor J.G. Schoeman, Krugersdorp; P.H. Newcombe, George; E.R. Smith (Visitor); J.F. Lategan, Brandfort; Councillor H.E. Geering, Cape Town; Councillor C.L. Gibb, Salisbury; Councillor H.J. Kelly, Randfontein; G.D. Lotter, Ladybrand; A.T. Turner, Umtali; H.A. Tinson (Visitor); C.R. Halle, Pietermaritzburg; Councillor E. Traub, Worcester.

Fourth Row: A.E. O'Dowd (Visitor); B. Mahon; P.A. Meintjes, Rustenburg; Councillor M.L. Rutter, Roodepoort; Councillor (Mrs.) A. Edwards, Krugersdorp; G.J. Muller, Krugersdorp; F. Anderson, Port Alfred; F.J. Head (Visitor); A.L. Sanders (Visitor); Councillor G. Moffat, Springs; E.L. Smith, Burgersdorp; J.I. Inglis, Ermelo; J.G. Downey, Springs; T.H. Mocke, Piet Retief; W. Theron, Klerksdorp; C.J.S. McMurray (Visitor); H.J. Gripper, Worcester; Councillor (Dr.) W.F. Knobel, Bethlehem.

Fifth Row: G.J. Privett (Visitor); W.J. Gibbons (Visitor); J. Wilson, Pretoria; H.N. Hancox (Visitor); D.G. Calder, Matatiele; Councillor S. van der Horst, Matatiele; A.E. Torrance (Visitor); C.J. Burton, Kimberley; V. Pickles (Visitor); S.G. Redman (Visitor); S.G. Mortimer (Visitor); A.J. Verryn, Middelburg, Trnsvaal; G. Gibbs (Visitor); Councillor R.M. Thomas, Durban.

Sixth Row: A.R. Sibson, Bulawayo; G. Delport, Bedford View; J.S. van Veldon, Pretoria; — Langford (Visitor); A.M. Ford, Winburg; B. Marchand, Witbank; J. Iverach, Grahamstown; T. Ashley, Queenstown; W. Denker, Johannesburg; P.L. Vergottini, Carolina; W. Rush, P.P. Rust; R. Leishman, Johannesburg; W. Denholm, Johannesburg; W.R. Gray, Johannesburg.

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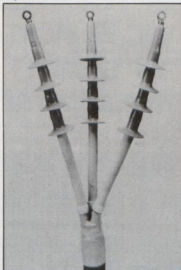
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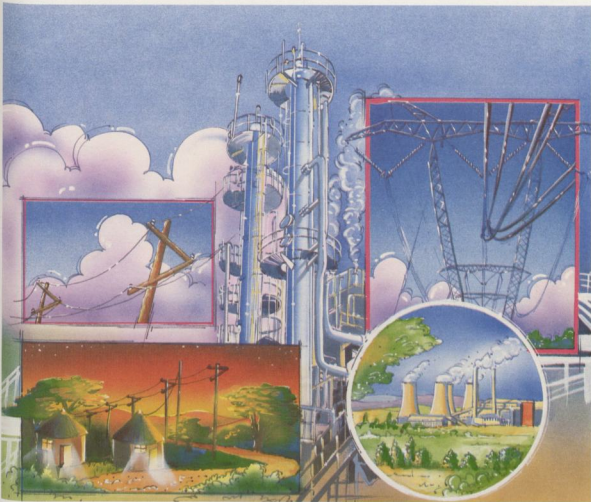
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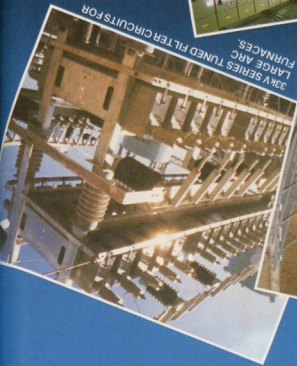
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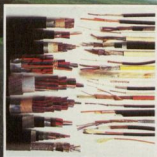


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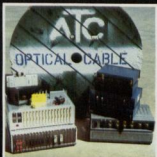


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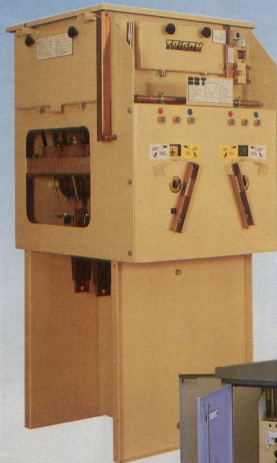
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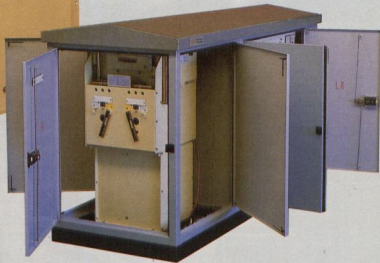
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