AMEU PROCEEDINGS

57th Convention Hosted by

22 TO 24 October 2001

AMEU

Proceedings 57th Convention 2001

Association of Municipal Electricity Undertakings (Southern Africa)

57th Convention – Hosted by The City of Tshwane
Official Proceedings
22 to 24 October 2001

The newly elected executive council of the AMEU
(Front row l. to r.) Howard Whitehead, Clr. Francis Grantham, President-elect Peter Fowles, President John Ehrich, At van der Merwe, Harden Beck, Clr. Des Halley,
(Middle row l. to r.) Trevor van Niekerk, Evert van Helden, Danie Potgieter, Clr RMM Lesoma, George Ferreira, Paul van Niekerk, Clr M Tokota, Clr. David Erleigh,
(Back row l. to r.) Technical Secretary AL Fortmann, Danie van Wyk, Publicity Secretary Max Clarke, Hennie Auret, Deon Louw, Kevin Grunewald, General Secretary Jean Venter.

Table of attendance:

Honorary Members	*10*
Retired Members	*10*
Affiliate Members	*151*
Non-Members	*79*
Engineer and Councillor Members	*122*
Accompanying Persons	*154*
Total	*526*

Secretariat: Van Der Walt & Company
P O Box 868, Ferndale, 2160
Tel: (011) 789-1384
Fax: (011) 789-1385
e-mail: ameu@vdw.co.za

Delegates and exhibitors

Past Presidents and Honorary members Denis Fraser (left) and Jules von Ahlfen (right) with newly elected Hon. Member Clive Burchell.

Newly elected Honorary members Clive Burchell (left) and Harden Beck (right) with President John Ehrich.

Tony Hugo, retired electrical engineer of Sandton and son of former President (1955-56) the late Dirk Hugo of Pretoria, congratulates John Ehrich on his election and bringing "the chain" back to Pretoria after half a century!

Jules von Ahlfen (left) and Eugene Pretorius share a joke with Al Fortmann (right), all three are Past Presidents and Honorary members of the AMEU.

Bryan Madeley and President John Ehrich enjoying the sunshine

Peter Fowles thanks delegates after his election as President-elect of the AMEU.

Clr. Lolo Ditshego, responsible for electricity at Tshwane Metro, host at the Civic Reception for delegates, being thanked by President John Ehrich.

Bertus de Jager (left) and At van der Merwe receive the trophy for the "Best Paper" award, from President John Ehrich

The Affiliates had a record number of exhibitors

Some of the performers in the singing and dance routines which formed part of the closing ceremony of the convention.

The largest number of exhibitors ever!

Contents:

VALEDICTORY ADDRESS

(AJ van der Merwe)

PERIOD: OCTOBER 1999 -OCTOBER 2001

Introduction

In my acceptance of the office of president of the AMEU, with the restructuring of the EDI on the doorstep, I pledged that the AMEU:

- *Would change what needed to be changed*
- *Would accept what could not be changed*
- *Would pray to God for the wisdom to understand the difference*

I trust that in the period under review the Executive Council and I have lived up to this goal. I have pleasure in submitting the report below giving the highlights of our work.

Restructuring of the EDI

The period of my presidency was extremely busy, dominated by the restructuring activities. We realised that we have to foster much closer ties with SALGA (organised local government) and therefore represented SALGA on the NECC, EDIRC and Group of Four, at NER forums, as technical advisors at MINMEC and in the Ministerial Cabinet Subcommittee, at SALGA AGMs and workshops, bilaterals with Ministers and senior officials of the DME, DPLG, NT and DPE, to mention just a few. In the majority of these cases, Howard Whitehead and I kept the technical input from the AMEU going via e-mail correspondence with members and by other means. This avenue and future electronic aids will have to be explored further to make a meaningful input in the forthcoming restructuring.

The details of the restructuring debate and the recent SALGA EDI workshop are available at www. AMEU/SALGA. Cabinet's resolutions and the accompanying SALGA stance can be found at www. AMEU and on the DME's Website. Copies of the revised PWC blueprint are available from the Secretary.

For the first time Government has clearly indicated the *quo vadis* of the EDI restructuring. We now know the Government's official stance. This must surely be seen in conjunction with the finalisation of the process of democratisation of local government in South Africa. We will either restructure exactly as per the blueprint or we will follow a developmental process. I see the restructuring as a process of *evolution* rather than *revolution*, and this is also the stance adopted by SALGA. Municipalities have to prepare their undertakings as (corporatised) businesses to optimise their position in the REDS and to ensure a revenue stream that will enable them to fulfill their constitutional obligations and to fund their delivery efforts. Without such preparation they may not achieve all the possible advantages for their communities. The role that EDI Holdings will fulfill is still to be defined and will have to be closely monitored.

A huge amount of work remains to be done in the restructuring process and will be split into various work streams. The AMEU will participate and will have to broaden its participation even more by utilising more members to ensure not only ownership of the process but also the necessary capacity and a meaningful role for municipal engineers

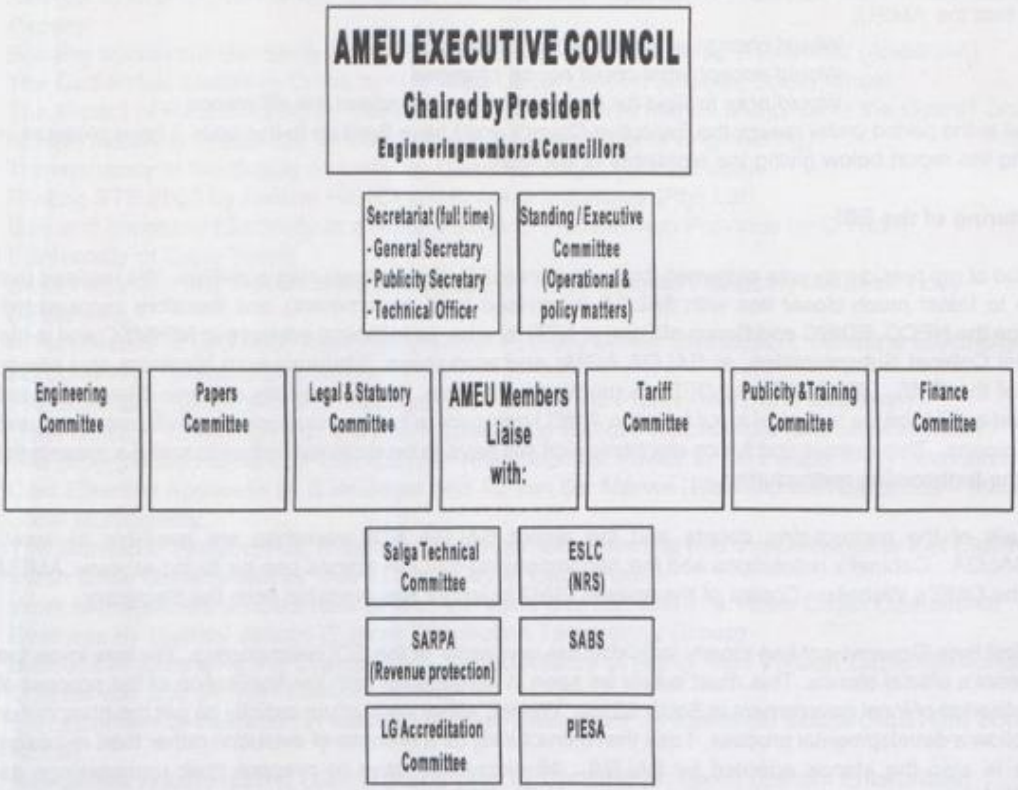
Future of the AMEU

The AMEU is an association of municipal undertakings and as such is different from an institute. The municipality is the member and not the engineer representing the municipality. The scene after demarcation changed from the previous 843 municipalities to a mere 250 municipalities, only a small – and changing – number of which supply electricity. The question is what will be the most suitable structure to support these changes. A subcommittee chaired by the President-Elect is currently investigating these matters.

A few small changes to the current constitution have been proposed and submitted to the convention for consideration. These suggestions are meant to pave the way for the envisaged changes in the industry. Further changes will be necessary and will be submitted in due course.

Structure of the AMEU

Structure follows strategy, but without structure to formulate the strategy administration and logistics in the AMEU will be impossible. The structure of the AMEU was revised, with a mission and vision being developed for each committee and a new committee (Tariff Committee) being formed to liaise with Eskom and the NER in order to meet the challenges of WEPS, EBSST, retail tariff conversion, etc. The new structure is illustrated in Figure 1.



AMEU Nutshell 3 (Figure 1)

Communication

We have endeavoured to improve our communication with members by boosting the AMEU Website, preparing more correspondence and bulletins and visiting all branches and sub-branches of the AMEU, where we have shared and distributed information on the restructuring and other industry matters. The secretariat is currently engaged in adding presentations, written papers and other documents to the Website. As part of our preparation for the changes to come we have invited numerous engineers to many forums and meetings to extend understanding, involvement and participation.

Liaison with other bodies

The AMEU liaises with various bodies in the execution of its duties. I am pleased to report that we have instituted regular meetings (known as "Imberbe meetings") with Eskom and have found much common ground on restructuring and many other industry-related issues. Eskom and the AMEU are the only service-providers in the industry. This relationship needs to be encouraged and built upon as our partners in the REDS to come in regular contact with the NER took place to liaise on industry matters. The bonds that have been forged must be maintained and future working relationships should be explored to the benefit of the industry at large.

As part of the government's African Renaissance, the AMEU has become actively engaged in the PIESA (Power Institute of East and Southern Africa) initiative. This has resulted in a great deal of contact with Africa utilities. This contact should be further developed, also in view of the likely changes in the formation and structure of the AMEU.

We have not been able to establish ties with other electricity utilities (besides those in Africa). Certain action is planned for November, but will have to be followed up more aggressively in the future.

To keep pace with changes in technology and the needs of members of such an association, the AMEU will have to become information-driven. We will have to support members in a variety of industry-related technical needs. The exact requirements in this regard need to be explored by the Executive and Secretariat.

In conclusion

Definite changes are before us. I envisage a vastly different industry five to seven years from now, with changes from generation and transmission, through distribution to the end customer. I believe that *in order to perform we have to transform*. We should see no Eskom, no local government distribution as we know them today. We would be naive to believe that we need not change if we are serious about serving a hungry community of energy consumers and surviving the commercial demands that utilities worldwide are facing. Perhaps our pace and magnitude of transformation and level of competition should be different and may necessitate a unique approach. If we wish to make a meaningful contribution, the AMEU must ensure that the rates of change outside our Association do not exceed the rate of change inside or the Association will become meaningless.

But we have done it since 1915. We can do it again. Let us take part in the process and keep the lights burning.

In conclusion, I would like to express my sincere appreciation for the input and support I have received from all the members of the Executive Council, the AMEU secretariat, my colleagues at BE and the Mangaung City Council during my term as President. It was a privilege to serve the municipalities and the electricity industry.

PRESIDENTIAL INAUGURATION ADDRESS - JOHN EHRICH

I am indeed honoured to have been inducted as President of the AMEU for the next two years, a period which I think will be very challenging yet interesting and exciting and in return I pledge my wholehearted an dedicated attention to the association.

Let me first of all express my sincere thanks to my Council, The City of Tshwane Metropolitan Municipality for their support and understanding as far as the presidency is concerned. The City of Tshwane I believe also shares in this honour.

In fact the City of Tshwane never lets one down. I choose the date such that the Jacarandas would be in full bloom and walla their you have it. I also factored this feature into the convention tie.

I would also like to thank the Council and in particular my Division for their contribution towards the success of the convention - it is sincerely appreciated.

Allow me to turn to the immediate past president, At van der Merwe, At thank you for your dedicated leadership, and your intense involvement in the affairs of the association.

The association has progressed in leaps and bounds and the partnership with SALGA has been mutually beneficial. I feel quite honoured to state that we now have the Chairperson of SALGA father Mkhatshwa and the President of the AMEU under one roof, so to speak.and this could further enhance the partnership.

Ladies and Gentlemen following in At's foot steps is going to be a hard act to follow. The good news however is that although At is no longer president, I don't intend relieving him of his involvement in the restructuring of the Electricity Distribution Industry. At from all of us, thank you.

The association has to undergo change to survive, change to accommodate restructuring, change to accommodate equity issues, change accommodate our members, change to better the service to Local Government. This change will demand a lot of our time and energy but I am afraid it has to happen. The association that you see today will be very different from the one you will see at the end of my term of office. I am committed to change to the benefit of all. Changes to the constitution will be addressed later at this conference. Change has already began.

In conclusion Ladies and Gentlemen I look forward to the two years ahead and with the support of all I know it will be an exiting, enriching and rewarding experience.
Thank you

EXECUTIVE COUNCIL ANNOUNCEMENT - 2001 to 2003

PRESIDENT			
JA EHRICH	**TSHWANE**	TEL :	(012) 308 4100
	P O BOX 423, PRETORIA 0001	FAX :	(012) 308 4149
	E-MAIL: eksteen.charlotte@pretoria.gov.za	CELL:	083 654 1217
PRESIDENT ELECT			
PE FOWLES	**THE MSUNDUZI MUNICIPALITY**	TEL:	(033) 355 1400
	P O BOX 399, PIETERMARITZBURG, 3200	FAX:	(033) 355 1559
	E-MAIL: pf15@pixie.co.za	CELL:	082 785 9420
MEMBERS			
HA AURET	**//KHARA HAIS**	TEL :	(054) 332 5911 X 2223
	PRIVAATSAK X6003, UPINGTON 8800	FAX :	(054) 331 2909
	E-MAIL: uptmuning@gem.co.za	CELL:	083 455 1237
GF FERREIRA	**NELSON MANDELA**	TEL:	(041) 994 1262
	PO BOX 45, UITENHAGE 6230	FAX:	(041) 994 1335
	E-MAIL: gfferr@isat.co.za	CELL :	082 577 4191
K GRUNEWALD	**GEORGE**	TEL:	(044) 874 3917
	P O BOX 19 GEORGE 6530	FAX:	(044) 874 3936
	E-MAIL: grg.elec@pixie.co.za	CELL:	082 491 7363
JG LOUW	**CITY OF CAPE TOWN**	TEL:	(021) 400 3300
	P O BOX 82,9th Floor (Executive Suite)		
	CAPE TOWN 8000	FAX:	(021) 400 5913
	E-MAIL: jglouw@cct.org.za	CELL:	083 631 2240
	E-MAIL : mkingswe@cct.org.za		
DET POTGIETER	**POLOKWANE**	TEL:	(015) 290 2272
	POSBUS 111, PIETERSBURG 0700	FAX:	(015) 290 2249
	E-MAIL: danie.potgieter@pietersburg.org.za	CELL :	083 627 6855
PJS VAN NIEKERK	**CENTRAL ELECTRICITY BOARD**	TEL:	(09230) 601 1100
	PO BOX 40, ROYAL ROAD, CUREPIPE	FAX:	(09230) 675 5090
	MAURITIUS		
	E-MAIL: pjsvniekerk@ceb.intnet.co.za		
E VAN HELDEN	**SEDIBENG**	TEL:	(016) 422 5465
	P O BOX 471, VEREENIGING, 1930	FAX:	(016) 455 4522
	E-MAIL: evert@lekoa.co.za	CELL:	083 325 3882
DJ VAN WYK	**UMHLATHUZE**	TEL:	(035) 901 5350
	PRIVATE BAG X1004,RICHARDS BAY,	FAX:	(035) 901 5444
	E-MAIL: dvawyk@richemp.org.za	CELL:	082 659 9446
TP VAN NIEKERK	**ABERDARE CABLES**	TEL:	(011) 456 4413
	P.O. BOX 1679, EDENVALE, 1610	FAX:	(011) 456 4349
	E-MAIL: tvanniekerk@aberdare.co.za	CELL :	082 892 1386
PAST PRESIDENTS			
HD BECK	**BUFFALO CITY**	TEL:	(043) 705 9601
	PO BOX 2001, BEACON BAY 5205	FAX:	(043) 748 3748
	E-MAIL:hardenb@buffalocity.gov.za	CELL:	083 309 7191
AJ VAN DER MERWE	**MANGAUNG**	TEL:	(051) 409 2210
	PO BOX 3704, BLOEMFONTEIN 9300	FAX:	(051) 409 2366
	E-MAIL: advm@be.bfncouncil.co.za	CELL:	083 577 1917
HR WHITEHEAD	**ETHEKWINI**	TEL:	(031) 300 1000
	PO BOX 147, DURBAN 4000	FAX:	(031) 306 3196
	E-MAIL: whiteheadhr@durban.gov.za	CELL :	082 566 1687
SECRETARIAT	**VAN DER WALT & COMPANY**		
JP VENTER	POSBUS 868, FERNDALE 2160	TEL:	(011) 789 1384
(GENERAL)	**E-MAIL: ameu@vdw.co.za**	FAX:	(011) 789 1385
		CELL:	082 556 8255
MPP CLARKE	CRESTA PALMS, 8 BERNHARD STREET,	TEL:	(011) 476 5925
(PUBLICITY)	CRESTA EXT 1,RANDBURG 2194	FAX:	(011) 476 5939
	E-MAIL: mppc@mweb.co.za	CELL:	083 454 3053
AHL FORTMANN	1 SUNWARD VILLAS, DUIKER RD	TEL:	(011) 896 2356
(TECHNICAL)	SUNWARD PARK, BOKSBURG 1459	FAX:	(011) 913 4815
	E-MAIL: afortman@iafrica.com	CELL:	082 602 4082

AMEU COUNCILLORS & CO-OPTED MEMBERS - 2001/2002/2003

Clr L Ditshego	**TSHWANE** P O Box 440, PRETORIA, 0001 **E-MAIL: ditshego.lolo@tshwane.gov.za**	TEL: FAX: CELL:	(012) 308 8753 (012) 323 0054 083 390 7145
Clr F Grantham	**MSUNDUZI** P O Box 321, PIETERMARITZBURG,3200 **E-MAIL: mayash@mweb.co.za**	TEL: FAX: CELL:	(033) 345 2184 (033) 345 2190 082 774 6185
Clr J Isaacs	**//KHARA HAIS**		
Clr MB Tokota	**NELSON MANDELA** P O 45, UITENHAGE, 6230 **E-MAIL:piambt@upe.ac.za**	TEL: FAX: CELL:	(041) 504 2336 (041) 583 1769 083 463 5305
Clr J Rogers	**GEORGE** P O Box 1001, GEORGE, 6530	TEL: FAX: CELL:	(044) 873 3924 (044) 873 2035 082 570 5229
Clr D Erleigh	**CITY OF CAPE TOWN** Private Bag X9181, CAPE TOWN, 8000 **E-MAIL: derleigh@capetown.gov.za**	TEL: FAX: CELL:	(021) 400 1203 (021) 400 1263
Clr B Hassim	**POLOKWANE** P O Box 331, PIETERSBURG, 0700 **E-MAIL: hassim.qs@webmail.co.za**	TEL: FAX: CELL:	(051) 291 3969 (015) 291 4451 082 459 3285
Clr D Plaatjie	**SEDIBENG**	TEL: FAX: CELL:	 082 905 2496
Clr DJB Moffatt	**UMHLATHUZE** P O Box 1004, RICHARDSBAY, 3900 **E-MAIL: dmoffatt@richemp.org.za**	TEL: FAX:	(051) 291 3969 (015) 291 4451
Clr Halley	**BUFFALO CITY** P O Box 134, EAST LONDON, 5200 **E-MAIL: rosew@eltlc.co.za**	TEL: FAX: CELL:	(043) 705 1075 (043)722 1024
Clr TG Lobe	**MANGAUNG** P O Box 3704, BLOEMFONTEIN, 9300 **E-MAIL: lucas@civic.fs172.co.za** **lobe@civic.fs172.co.za**	TEL: FAX: CELL:	(051) 405 8664 (051) 405 8663 083 256 9838
Clr RMM Lesoma	**ETHEKWINI** P O Box 1014, DURBAN, 4000 **E-MAIL: lesomam@durban.gov.za**	TEL: FAX: CELL:	(031) 311 2010 (031) 311 2034 083 289 6914
CO-OPTED MEMBERS			
Neil Croucher	**CITY OF CAPE TOWN** P O Box 82, CAPE TOWN, 8000 **E-MAIL: ncrouche@cct.org.za**	TEL: FAX: CELL:	(021) 400 2500 (021) 918 7172 083 417 7162
Raymond Grunig	**MIDDELBURG** P O Box 14, MIDDELBURG, 1050 **E-MAIL: council@middelburgsa.co.za**	TEL: FAX: CELL:	(013) 249 7220 (013) 243 2550 083 628 8273
David Michie	**NELSON MANDELA** P O Box 369, PORT ELIZABETH, 6000 **E-MAIL: dmm@pemelec.co.za**	TEL: FAX: CELL:	(041) 392 4101 (041) 392 4333 082 653 2232
Mark Wilson	**EKURHULENI** P O Box 215, BOKSBURG, 1460 **E-MAIL: wilsonm@boksburgcouncil.co.za**	TEL: FAX: CELL:	(011) 899 4029 (011) 892 4806

THE CONVENTION VOTED AND APPROVED THE FOLLOWING CHANGES TO THE CONSTITUTION OF THE AMEU:

AMENDMENT 1

SALGA

Following a request from SALGA, as part of the formal SALGA process of recognition of local government professional bodies, the Council proposes the replacement of the following clause:

Replace -

5.1 to provide an advisory service to its members, and to provide an advisory service to the customers of its members.

with -

5.1 to provide an advisory service for its members, for the customers of its members and for the South African Local Government Association.

AMENDMENT 2

DEFINITION OF UNDERTAKING

To allow significant operational divisions of undertakings to take up membership of the AMEU and to recognise the new powers and duties of municipalities in the provision of electricity, the Council recommends a broadening of the definition of "undertaking". The new definition is deemed sufficiently broad to make the old non-municipal membership category redundant and its deletion is recommended.

DIE KONVENSIE HET MET 'N GESKIKTE MEERDERHEID BESLUIT OM DIE GRONDWET VAN DIE VMEO SOOS VOLG TE WYSIG:

WYSIGING 1

SALGA

Na aanleiding van 'n versoek van SALGA, as deel van die formele SALGA-proses van erkenning van professionele liggame waarby plaaslike regering betrokke is, beveel die raad die vervanging van die volgende klousule aan:

Vervang -

5.1 om 'n adviesdiens aan die lede te voorsien en om 'n adviesdiens aan die klante van die lede te voorsien;

met –

5.1 om 'n adviesdiens aan sy lede, die klante van sy lede en die South African Local Government Association te voorsien;

WYSIGING 2

DEFINISIE VAN 'N ONDERNEMING

Om beduidende operasionele afdelings van Ondernemings toe te laat as lede van die VMEO en om erkenning te verleen aan die nuwe magte en pligte van munisipaliteite ten opsigte van elektrisiteitsvoorsiening, beveel die raad 'n verbreeding van die defenisie van "onderneming" aan. Die voorgestelde wysiging word as wyd genoeg beskou om die huidige definisie van "nie-munisipale ondernemings" te omsluit, welke definisie gevolglik geskrap kan word.

Replace -	Vervang -
1.5 "undertaking" is a licensed local government body carrying on an undertaking for the supply of electricity;	1.5 "onderneming" 'n gelisensieerde plaaslike regeringsliggaam wat 'n onderneming vir die verskaffing van elektrisiteit bedryf;
with -	deur -
1.5 "undertaking" is a body or significant operational division of a body licensed or authorised by a municipality to generate, transmit or distribute electricity on its behalf, as a service provider.	1.5 "onderneming" 'n ligaam of 'n beduidende bedryfsafdeling van 'n ligaam wat deur 'n munisipaliteit gemagtig of gelisensieer is om, namens hom, elektrisiteit op te wek, te versend of te versprei;
Delete -	Skrap –
1.6 "non-municipal undertaking": an electricity undertaking which is not part of local government";	1.6 "nie-munisipale onderneming": "'n elektrisiteitsonderneming wat nie deel is van plaaslike regering nie";
Delete -	Skrap -
7.2.6 Non-municipal undertakings	7.2.6 Nie-munisipale ondernemings
AMENDMENT 3	**WYSIGING 3**
MEMBERSHIP CATEGORIES The Council recommends certain changes to the membership categories of the association, to facilitate changes in the composition and status of members brought about by the re-demarcation of local government during the year 2000.	**LEDEKLASIFIKASIES** Die raad beveel verskeie veranderings aan die ledeklassifikasies van die Vereniging aan om in te pas by die implikasies van die samestelling en status van lede wat teweeggebring is deur die herafbakening van plaaslike besture in die jaar 2000.
ENGINEER MEMBERS:	**INGENIEURSLID:**
Replace -	Vervang -
8.2.2 ENGINEER MEMBER: The person in overall charge of the member undertaking;	8.2.2 INGENIEURSLID: Die persoon in algehele bevel van 'n lidonderneming;
with -	deur –
8.2.2 ENGINEER/EXECUTIVE MEMBER: The official in overall charge of the member undertaking, or his nominated representative;	8.2.2 INGENIEURS-/UITVOERENDE LID: Die beampte in algehele bevel van 'n lidonderneming of sy genommineerde verteenwoordiger;

Replace Engineer Member throughout the text of the constitution with Engineer/Executive Member.	Vervang alle verwysings na Ingenieurslid met Ingenieurs-/Uitvoerende Lid in die konstitusie.
ASSOCIATE MEMBER:	**ASSOSIAATLID:**
Replace -	Vervang -
8.2.3 ASSOCIATE MEMBER: One or more senior staff in the permanent employ of a member undertaking;	8.2.3 ASSOSIAATLID: Een of meer senior personeel in die permanente diens van 'n lidonderneming;
with -	deur -
8.2.3 ORDINARY MEMBER: One or more senior staff members in the employ of a member undertaking, or Councillors or Board members of the undertaking;"	8.2.3 GEWONE LID: Een of meer seniorpersoneellede of raadslede wat in diens is van 'n lidonderneming;
Replace all references to Associate Member in the Constitution with Ordinary Member.	Vervang alle verwysings na Assosiaatlid waar dit ook al in die Grondwet voorkom, deur Gewone Lid.
TRANSITION CLAUSE:	**OORGANGSKLOUSULE:**
Replace -	Vervang -
8.2.7 "Paid up engineer members of undertakings that have become part of a metropolitan or substructure council in terms of the Local Government Transition Act, or a regional electricity distributor, shall retain their status and rights in terms of the Constitution whilst they remain in the employ of the new undertaking."	8.2.7 Opbetaalde ingenieurslede van Ondernemings wat deel geword het van 'n metropolitaanse of substruktuurraad kragtens die Oorgangswet op Plaaslike Regering, of 'n streekselektriese verspreider, behou hulle status en regte kragtens die Grondwet terwyl hulle in diens is by die nuwe onderneming.
with -	deur -
8.2.7 "Paid-up engineer members of undertakings that have become part of a new municipal undertaking in terms of legislation may become ordinary members whilst they remain in the employ of the new undertaking."	8.2.7 Opbetaalde ingenieurslede van ondernemings wat ingevolge wetgewing deel geword het van 'n nuwe munsipale onderneming, mag 'n gewone lid word solank as wat hulle in die diens van die nuwe onderneming is.

VOTING BY MEMBERS: Replace - 12.1 Each member undertaking shall at any Convention or Technical Meeting be entitled to two representatives with voting rights who shall be nominated by the member undertaking for this purpose. One such representative shall be the council or board representative and the other an engineer member or an associate member. with - 12.1 Each member undertaking shall at any Convention or Technical Meeting be entitled to two representatives with voting rights, who shall be nominated by the member undertaking for this purpose. One such representative shall be the Council or Board representative and the other an engineer/executive member.	**STEMMING:** Vervang - 12.1 Elke lidonderneming is by enige Konvensie of Tegniese Vergadering geregtig op twee stemgeregtigde verteenwoordigers wat vir die doel deur die lidonderneming genomineer word. Een sodanige verteenwoordiger moet die raads of bestuursverteenwoordiger en die ander een 'n ingenieurslid of assosiaatlid wees. deur – 12.1 Elke lidonderneming is by enige Konvensie of Tegniese Vergadering geregtig op twee stemgeregtigde verteenwoordigers wat vir die doel deur die lidonderneming genomineer word. Een sodanige verteenwoordiger moet die raads of bestuursverteenwoordiger en die ander 'n ingenieurs-/uitvoerende lid wees.

HONORARY MEMBERSHIP

It is recorded that the Convention bestowed Honorary Membership on Mr Harden Beck, Past President of the AMEU. (Acceptance speach on the next page.)

PRESIDENT ELECT

It is recorded that the Convention elected Peter Fowles, City Electrical Engineer of Msunduzi, as President Elect of the AMEU.

ACKNOWLEDGEMENT SPEACH ON RECEIVING HONORARY MEMBERSHIP.
HARDEN BECK

Mr. Mayor, Mr. President, Distinguished Guests, Colleagues and Friends.
At a time like this a few expressions of thanks are appropriate:

- To my employer, the East London Administrative Unit of the Buffalo City Municipality, for making possible and supporting my activities in the AMEU.
- To those members of the AMEU who elected me to the Executive Council of the AMEU;
- To Jean Venter; for his unflappability and considered advise over the years;
- To Neil Croucher, this morning, for his kind words for proposing me for Honorary Membership of the AMEU.

For a number of years the AMEU has been preparing for the advent of the Restructured Electricity Distribution Industry. As you know, this will result in substantial changes to the AMEU's form.

These two things made me think about what the AMEU has meant to me over the years. To do this it is necessary to look at the AMEU from several perspectives or angles.

Apart from the formal or constitutional activities of the AMEU, it has a number of other facets which are detailed hereafter. There is the fellowship, camaraderie and mutual support of the members. At another level, extending the mutual support aspect, the AMEU is a valuable information network for its members. Some might say it is an old boy's network, but I think that would an unfair exaggeration.

There is a wealth of extra – mural activities and knowledge embedded in the AMEU membership. An example of this is Tony Alty, who has since retired. He has an extensive knowledge of philosophy, birds – of the feathered variety – and astronomy.

Hospitality and conviviality, and the opportunity to attend regional meetings away from one's home region. A particularly good example of this, for me, was a combine meeting of the Western Cape Branch and the Executive Council in Robertson. This was so enjoyable that I felt that Robertson was the place to retire to. Berna did not, and does not agree! I must say, loud and clear, that this hospitality is not restricted to Robertson, but that seemed a good example to me.

All of you here present will agree that life consists of a series of tests and deadlines. Quite often, they are well distinguished, but they are there, in one form or another. Arranging AMEU Convention or Technical Meeting consists of a plethora of tests and deadlines which it has been my privilege to participate in. The incoming President, John Ehrich, has just been through this series of hoops. He has emerged in his usual style, unruffled and unscathed. As an aside, I would like to comment John and the Team from Tshwane City for the arrangements today.

Returning to the AMEU and its future in light of the planned structure. In any newly-organized industry, there will be a need for a body such as the AMEU, even if its form of radically different. To misquote, "The AMEU is dead, long live the AMEU".

This morning I have mentioned several people and places by name. Doing so means the omission of others, equally – deserving people or places. Please excuse those omissions, which are for brevity and not by intent.

One name which I cannot omit is my wife, Berna. She has quite encouraged me in my AMEU activities though the years. At times, she has, rather less quietly, guided and restrained me! On occasions she has compared herself to Penelope. This, I feel is inaccurate and quite unjustified. However, she has always been loyal and supportive. For this, I record my sincere appreciation and thanks to her.

Finally I would like to thank the AMEU, and all of you, for this Honorary Membership conferred on me today.
- Thank you!

Building Successful Electricity Distribution Utilities in South Africa

ANDERSEN

Author & Presenter: F Cranmer BSc(Hons) MSc – Senior Manager, Andersen
Co-author: P J S van Niekerk PR.Eng – General Manager, Industry Restructuring, City Power Johannesburg

The South African electricity industry is currently the subject of immense interest and scrutiny due the national restructuring initiatives as well as the changes in local government legislation. For many, the restructuring efforts themselves are an end, not a means, being the culmination of many years of debate about their purpose and form. However, South Africa is not the first country to embark on such an extensive exercise of restructuring and lessons can be learned from those that have gone before us into this minefield of opportunity and challenge.

Successful distribution utilities have sprung up around the world, driven to streamline their businesses by the forces of restructuring and privatisation. Fundamentally, the shift from a bureaucratic to a commercial business emphasis has directed the reengineering of these utilities. Whilst all utilities have not necessarily chosen the same strategy for success, one theme is common, commerciality.

Commercial businesses differ from their bureaucratic counterparts in their single-minded adherence to strategies related to customer satisfaction and financial viability. There is a direct correlation between the success of these businesses and their ability to clearly understand, articulate and remain true to their stated business purpose.

Restructuring initiatives whilst often intent on rationalising services and reducing the burden on government regularly fail to set clear goals in terms of performance standards and commercial targets which will ensure their long term viability and sustainability.

Large-scale transformation of any business can be both traumatic and exciting. The key is to understand the drivers for change and not to allow competing objectives to destabilise the process. Too often, despite the initial intention to create financially viable, customer-centric businesses, political and personal fears result in a dilution of focus and direction. The result, invariably, is a business that does not live up to its early potential and which lacks true identity and purpose.

One of the many challenges that South Africa faces in terms of the electricity industry restructuring exercise is to clearly define the motivation for change and to link this with desired outcomes in terms of performance targets for the new RED entities. It is all too easy to become side-tracked by the details of implementation and the inevitable desire to deviate from the original course as the challenges mount.

The South African electricity distribution sector is particularly marred by tremendous financial burden; not only is it required in many instances to generate sufficient revenues to fund non-profitable municipal services, but it is also dogged by high levels of non-payment and theft. Any focus on customer service at an electricity-only level is largely unachievable due to the high degree of integration of these services within the municipal structures. Any separation of the finances of the electricity entities, even for the purposes of performance management is highly problematic. All of these issues make the transition to viable and commercially-oriented utilities a difficult, but vital move.

The City of Johannesburg recognised the need for a realignment of its municipal services, resulting in the design of the Igoli 2002 plan. As part of this plan, an electricity utility, wholly owned by the Metropolitan Council, but run along commercial lines, City Power, was incorporated. A key aim of the utility is to provide cost effective, yet reliable and high quality service to the residents of Johannesburg. In order to achieve the high levels of performance set out by the Council's Contract Management Unit, City Power not only needs to manage the operational, or asset side of the business better than it ever has before, but it also has taken over responsibility for the interface with its customers and for all of its finances. For the first time it must manage its entire business value chain. Whilst the City as shareholder and service authority has the right to monitor the performance of the utility on all fronts, the utility is expected to be financially viable as well as uphold its status as an arm of state.

The model used for City Power and its sister companies in Johannesburg complies entirely with recently promulgated Municipal Systems Act. Importantly, the Systems Act allows for the formation of municipal entities companies under the Companies Act which have Council ownership, and which may perform the role of service

provider. Options, which need to be understood and reviewed prior to taking such a step, are the formation of departments or business units within the Council structures which may perform the same role, but which legally differ from corporatised entities.

Due to the Demarcation Act, many councils find themselves in a position where a number of electricity departments exist within a single council area. A goal of the new local government legislation is to standardise service across council areas and in so doing calls, as a minimum, for a consolidation of these services into single units per authority. This amalgamation of previously different departments in itself can be seen as the restructuring described earlier. Once again, such a restructuring drive should not be viewed solely as a compliance with legislation, but more as an opportunity to focus on the business imperatives of service provision and the impact on the financial success of electricity distribution entities and local authorities alike.

International experience would suggest that large-scale restructuring of an entire sector, as is envisaged for the South African electricity distribution industry, through the creation of REDs, is likely to take many years to complete. A more efficient and pragmatic approach would be to undertake the restructuring through a phased approach, which would encourage improvement and transition at all stages within the process. The need for both consolidation at a local government level and rationalisation at a national level lend themselves to such a phased approach. Critically there is a need to ensure that no unnecessary burden, financial or operational, is placed on either the sector or its customers, by sudden, dramatic change.

A phased approach allows all stakeholders to be considered within the transition framework. It importantly embraces the requirements of local government legislation and consolidation whilst keeping a clear eye on the over-arching goal of national EDI restructuring. It sets out measurable, achievable steps toward financial stability and service improvement, whilst not attempting to shock the system by introducing too much change too quickly. Change in the sector is greatly needed, but can be managed to ensure sustained and across-the-board success for the longer term.

The South African electricity distribution industry is at an exciting, yet daunting stage in its development. In order for the restructuring initiatives to yield the benefits that they are seeking, it is imperative that a business approach, including a clear and upfront definition of purpose and desired outcomes is assumed. Successful utilities that provide excellent service to their customers and remain financially viable are built on business principles. Such utilities would inevitably lead to economic success for South Africa as a whole.

THE CALIFORNIAN ELECTRICITY CRISIS

GR Tosen & SJ Lennon – Eskom South Africa

INTRODUCTION AND BACKGROUND

In the early 1990's California was in economic recession, with high levels of excess capacity in the electricity sector. In order to diversify the state's economy and reduce the cost of doing business in California, a variety of actions were agreed upon – this included the restructuring of the electricity sector. For several years this restructuring was successful, however as demand increased and excess capacity ran out, the situation changed. Supply was not available to meet the ever increasing demand, the transmission system was unable to deliver the supply that was available, and wholesale prices, which were uncapped, soared, as opposed to most retail prices which remained capped.

In the summer of 2000, wholesale energy prices soared to an average of $0.126 / kWh, compared to the limit of $ 0.054, for example, that Pacific Gas and Electric (PG&E) was allowed to charge its customers on average for energy (since increased temporarily to $ 0.067). (Current South African wholesale tariffs are < $ 0.01). In San Diego, where retail prices had been unfrozen after stranded costs had been recovered, electricity bills doubled in the face of the higher wholesale prices. With retail prices frozen, the two major Californian utilities, PG&E and Southern California Edison (SCE) ran up huge deficits as they sold electricity to consumers at prices far below the cost of purchasing it. High wholesale prices as well as a lack of supply, have resulted in rolling blackouts and a financial crisis. The utilities have accumulated debts of over $12 billion, and are on the verge of bankruptcy (PG&E have already filed for bankruptcy).
Blackouts up to the end of March have already cost the state of California in excess of $2.7 billion and a state of emergency has already been called with respect to the power crisis. With very little additional generating capacity

planned or expected in 2001, the prospects for the crisis to escalate are extremely high. This paper describes the fundamental causes of the crisis, current remedial measures and analyses the implications for South Africa.

History of the Californian Electricity Crisis In the early 1990,s California had slipped into a deep recession, largely due to cuts in USA defence spending. In order to rejuvenate the local economy and make it easier to do business in California, several measures were agreed. This included the restructuring of the electricity sector. The restructuring of the industry mainly entailed the following:-

- Utilities retained their obligations as servers of last resort, but customers were given a choice of supplier.
- Utilities to voluntary divest of at least 50% of their gas fired generation. (In reality utilities divested virtually all of their generation due to the structure of the divestiture incentive offered)
- Utilities had to sell all power to the power exchange, and then purchase all of their power from the same entity.
- Utilities were prohibited from long term forward contracts to hedge risks
- Utilities could recover stranded costs over a 5 year period through the freezing of retail prices at a level anticipated to provide appropriate returns.
- Two new agencies, an Independent system operator (ISO) and a power exchange (PX) were created. (Transmission assets were retained by the utilities.)

In essence, over the past twenty years California has transformed its electric system from one that was integrated and highly regulated to one that is unbundled and increasingly subject to competitive markets and federal oversight. Although the state retains regulatory control over utility distribution systems, the Federal Energy Regulatory Commission (FERC) regulates the transmission system operations and transmission rates. The FERC also regulates the terms and conditions of most power trades in California because most are now wholesale transactions rather than retail transactions which would be subject to state regulatory oversight. In addition, power sales and transmission are controlled mainly by the ISO and PX that have no duty to serve California's public.

Today California is confronting an unprecedented electricity crisis which threatens to wreck its economy and cause collateral damage throughout the western USA. The reason for this crisis is an extremely rapid increase in electricity wholesale prices, exacerbated by price caps at the retail level. This situation is reflected in the figure below which indicates the real cost of supply to the utility versus the cost to a typical domestic consumer.

The Causes of the Californian Electricity Crisis

The initial causes of the high wholesale market prices reflect a complex mixture of a faulty restructuring plan, faulty regulation, environmental regulations, and unanticipated reductions in the supply and increases in the demand for electricity. These problems have now been compounded by the financial insolvency of the investor-owned utilities. The crisis had its origins in mistakes and miscalculations at the time the electricity sector was being restructured. Two of many regulatory shortcomings stand out namely:

- Firstly utilities were strongly encouraged to divest a substantial portion of their generation, while being blocked by regulations from entering into stable long-term contracts. Put differently, the utilities were forced to procure their unmet needs on the spot market where extreme price volatility has been realised especially in the past year.
  Secondly, California regulator froze retail rates at low levels and banked on low wholesale prices to support a profit margin high enough to enable the utilities to pay off historical, uneconomic investments (stranded costs). This arrangement appeared to work with only modest problems for two years (1999 and 2000).

However, since May of 2000, wholesale market prices soared, due to rising demand, dramatically higher natural gas prices, lower imports from other states, and strategic behaviour by suppliers. Fixed retail prices blocked conservation efforts by insulating consumers from market realities and reduced consumer incentives to turn to competitive retailers. The heavy reliance on spot market purchases, combined with demand that was unresponsive to prices, helped drive prices higher.

Meanwhile, the investor-owned utilities were losing money on the electricity they bought for resale to their customers. The inversion of the typical wholesale-retail price relationship has brought these utilities to the brink of bankruptcy. Perceived risk of non-payment has in turn caused generators to be reluctant suppliers, even at dramatically elevated wholesale prices. The natural reluctance of suppliers to supply voluntarily when they did not expect to get paid was a substantial contributor to rising prices and rolling blackouts during the past five months.

The destruction of the utilities' credit and the resulting responses by suppliers has shattered all vestiges of a normal market. As a consequence, California now has both a financial crisis and an electricity supply crisis. In addition to

the regulatory failings, the question of why prices increased so rapidly needs to be addressed. In this regard the following observations are made:-

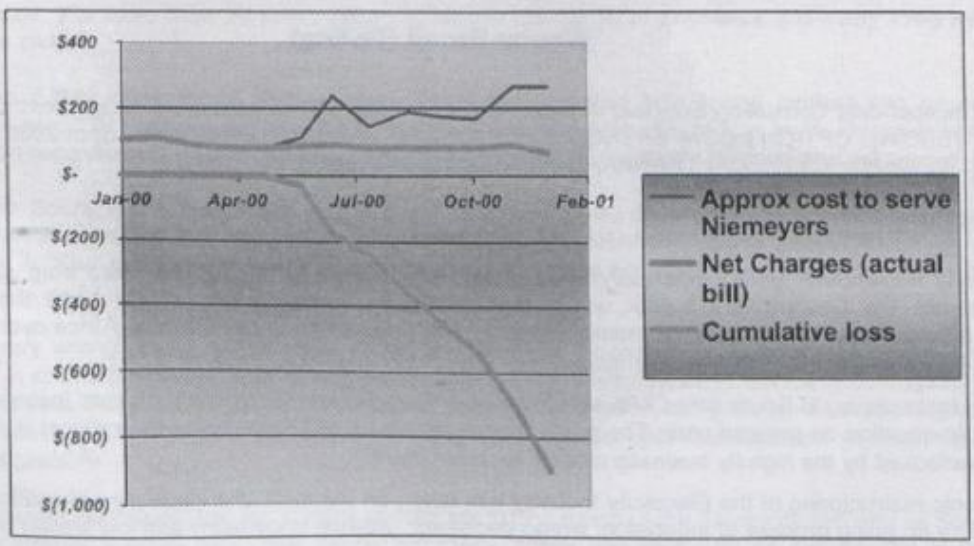
- The wholesale markets did not function properly.
- Due to a lack of an environment conducive to investment in new plant and infrastructure, Generation and Transmission capacity did not keep up with growth. In addition there was no institutional energy planning programme.

As a result no new generating capacity was installed during the 1990's and minimal new transmission lines were built. The reasons for this were onerous environmental restrictions as well as an uncertain regulatory environment. An additional complication was that utility DSM programmes, historically regarded as international role models, were abandoned as utilities no longer owned generators and had no incentive to manage load. The introduction of a public goods charge was ineffectual in reversing this damage. The supply side problems were exacerbated by high oil and gas prices as well as low rainfall, resulting in limited capacity being available from out of state hydro plants.

- The market-clearing price in a constrained market led to price spikes.
- Price caps and lack of hedging trapped utilities.
- Retail price caps eliminated incentives for demand responses from customers.
- Lack of wholesale hedging led to volatility and a credit crunch.
- Divestiture exposed utilities to the brunt of the market.
- Link between utilities owning generation and their obligation to supply was severed.
- Price volatility then led to extreme financial exposure.
- Environmental sensitivities and legislation prevented generation capacity expansions and the construction of new transmission lines.
- The speed with which demand growth outpaced capacity additions was not foreseen - and no institution or mechanism was provided to assure adequate generation

One Customer's Perspective

Cumulative deficit for PG&E to serve one family in Silicon Valley



Costs of the Californian Electricity Crisis

To date the costs of the crisis have been immense and no immediate reduction is anticipated for 12 – 24 months. The following costs should not be highlighted: -

- Edison International's (owners of Southern Californian Edison) credit rating slipped 11 notches from A- to C, which totally inhibits future investment by them as well as a considerable increase in the cost of borrowings.
- Customer electricity rates increased by 40% on average in April 2001. Some tariffs increased by 80% and further increases are likely.
- In stepping into the power buying function, th State of California has sustained $6 billion in losses, which resulted in a downgrading of its credit rating.
- The attractiveness of California as a fixed investment destination has been seriously impeded. It should be noted that the situation will take at least 12 – 24 month to address, and the Californian economy is likely to be severely negatively impacted over this period. In particular Silicon Valley companies are not even able to resort to distributed (own) generation in the form of gas or diesel due to local emission constraints. As such many are now likely to relocate out of California. This presents opportunities for states with more reliable and lower cost energy.

Response Measures to the Californian energy Crisis

The response of the Californian legislature has been inadequate to deal with the situation, primarily due to a political lack of will to increase prices in the retail sector. A focus was instead placed on voluntary energy efficiency programmes which have not succeeded. Current activities aimed at solving the problem include:-

- The state taking over customer power purchasing requirements – hence incurring considerable losses.
- Contracts have been signed with generators to lock in some portion of future power needs.
- New plant siting and building is being encouraged – although onerous conditions and processes remain unchanged.
- The energy portion of bills has been increased by up to 80% to promote energy saving and reduce the losses of the state.
- The sale of transmission assets to the state is being considered as a means of addressing the large debt balances and insolvency issues for the utilities. (PG&E remains in bankrupcy).

THE IMPACT OF RESTRUCTURING on the STABILITY, REVENUE PERFORMANCE and PRICE of the OVERALL SOUTH AFRICAN METERING SYSTEM.

Wouter Brand (Pr.Eng)

Independent Consulting Engineer in Systems Engineering and Operational Management. Speaker at VENDING OPTIONS CONFERENCE March 2000, METERING EUROPE 2000 Sept 2000 and SUB-SAHARAN POWER CONFERENCE Feb 2001.

1. SUMMARY.

This paper is not another good hope story from Africa. With access to *operational data* from several meterin systems across the Country, the Author warns that current restructuring efforts may head the South Africa Electricity Industry towards imminent economic collapse. The price of electricity in South Africa over the next 3 or years may increase by 150% and possibly much more.

Comparing *restructuring* in South Africa with *deregulation* in Europe and elsewhere, the paper focuses on the uniqu South African situation on ***ground zero***. There are serious problems and risks on the Operational level, the gravity o which is overlooked by the high fly business models for restructuring.

The economic restructuring of the Electricity Industry has taken on the form of a stage play of political and persona agendas. The on going process of indecision; wrong decisions, growing uncertainty and low worker moral has drive fragile revenue and operational processes to the point of near collapse. For most metering systems in South Afric today, the only cure are very expensive (and often badly controlled) *outsourced management solutions*.

This paper calls for a stop to political interference in electricity revenue processes. It calls for the termination or dela of current *restructuring efforts* because it is unclear in its objectives. It is unable to make decisions and it is no addressing the right issues.

Most of all this paper calls on Leadership within Organised Industry. There is an old saying that says; ***it is the dut of managers to do things right. It is the task of Leaders to do the right things.***

2. RESTRUCTURING IN SOUTH AFRICA. A COMPARISON WITH DEREGULATION IN EUROPE AND THE USA.

The main aim for deregulation of the Electricity Industry in Europe and USA was to stimulate competition, to curb the powers of monopolistic Utilities and to bring the price of electricity down.

Deregulation in Europe was successful in bringing down the price of electricity by more than 25%. Critics however, believe it will be short lived only. Despite this achievement, domestic consumers in Europe and the USA still pay 3 to 5 times more for electricity compared to South Africa (comparison not made by exchange rates, but using comparatives such as a litre of milk and a loaf of bread). The South African engineering achievement is even more remarkable when considering its own burden of inefficiencies such as *technical and non-technical kWhr losses* (mainly open air reticulation) is in the order of 9% compared to the European 3% (mainly underground reticulation and presumably much less tampering).

As opposed to deregulated and horizontally structured Electricity Industries of *electrified countries* (Europe and USA). In Germany alone, there are some 300 utilities pumping electricity in the national grid and the grid owned by some 8 companies (stats from 1999). The South African Electricity Industry is *regulated* and it is *vertically structured* with ESKOM generating and distributing 97% of electricity.

Four years of deregulating the Electricity Industry of Europe and USA has made true the old saying ***"Sometimes one achieves exactly the opposite what was set out to do"***.

With the United Kingdom still to decide how to get on the applecart, deregulation in Europe has not succeeded in curbing the powers of major Utilities. In fact, today the major Utilities in Europe are bigger and stronger than ever. Old and well established Utilities apparently unable to get to terms with new and strange concepts such as 'grid ownership'; 'energy trading', 'shareholders' etc. were quickly swallowed by the bigger Utilities.

Major Utilities in Europe (and also ESKOM) play a critical role in setting *International Industry Standards*. However, with no *Electricity Regulator* to protect the interest of the Consumer, the major Utilities of Europe decide what is good for Consumers and how much they will pay for it. ENEL (Italy) is now replacing the 27million credit electricity metering system towards an *Automatic Meter Reading* (AMR) system. It is unclear how and how much Consumers will pay for this. VDEW (Germany) openly opposes the introduction of prepayment and other forms of intelligent electricity in Germany and Europe.

With benefit of hindsight, one Engineer from Norway at the METERING EUROPE 2000 CONFERENCE in Munich (Sept 2000) said *"For more than 90 years electricity was in the hands of Engineers and every thing went well, until the Politicians came"*.

The California (USA) deregulation disaster has clearly demonstrated how wrong matters can go when political decisions and personal agendas are allowed to over rule engineering and business logic. Deregulation for the sake of deregulation regardless of how it may affect the delicate nature of electricity revenue processes.

Not unique to South Africa but indeed much more uncompromising is *political interference* in fragile electricity revenue processes. As one Engineer at the 3rd Annual SUB-SAHARAN POWER CONFERENCE in Midrand (Feb 2001) has put it. ***"Our problem in South Africa today is that there are simply too many politician in the engine room".***

It would be very wrong indeed not to acknowledge the vital role played by Councillors and Community Leaders in South Africa in normalising the culture of non-payment and being instrumental in the many successful electrification projects in the past decade. There are indeed Leadership on Local level taking the job of supporting and protecting electricity revenue processes very serious and without which successful management of metering systems will simply not be possible.

However, it cannot be denied that the current debate on *restructuring* of the Electricity Industry of South Africa has taken on the form of a *stage play*. With simply too many *actors* and each with its own version of the play script (referring to the presentation of Chris Yelland Managing Editor of EE Publishing at the SUB-SAHARAN POWER CONFERENCE Feb 2001). Listening to the various Speakers at this conference, what quietly came to the engineering mind is the realisation that the future and destiny of the South African Electricity Industry may now be in the hands of highly acclaimed people not knowing the definition of a kilowatt-hour let alone the business logic of electricity.

It came as no surprise when the City of Johannesburg went ahead and did what was the right thing to do. The formation of CITY POWER was a demonstration of Leadership. Indeed, other Regional Distributors may be forced to follow the same route. The Minister has warned that bad behaviour of 'naughty children' will not be allowed.

Price is the ultimately measure of cost and revenue performance and it is a fact that price and quality of supply of South African electricity come second to no other Country in the World. The average European domestic Consumer pays 3 to 5 times more for electricity. In Switzerland the unit cost to generate electricity is more than the domestic price in South Africa. Such comparatives are powerful indicators that the Electricity Industry of South Africa is (or was) inherently healthy, a fact seemly ignored by the political drive for restructuring. It reminds of the old rule of maintenance *'sometimes it is best to leave well alone'.*

European and USA style deregulation of the South African Electricity Industry will not work. By the same argument the wisdom of major restructuring of the South African Electricity Industry should be questioned. Indeed, the Electricity Industry of South Africa will not escape change especially not its retail side. Hopefully it will happen along the lines of *decentralisation* as the Namibia Government with its *grass root level* policy has set the standard and whereby resources of *Regional Municipal Electricity Undertakers* can be thrown together to optimise the availability and affordability of electricity on the places it is needed most.

The opposite of this approach is *centrism* and whereby Central Government retains the right to formulate unworkable and impractical policies on electricity (and other services) and then instruct Local Authorities to enforce such policies. Worse still would be if such policies seem to have confuse the issues of *economic restructuring* and *politics transformation of the work place*, which indeed are two entirely different issues.

3. INDECISION, WRONG DECISIONS and UNCERTAINTY POSES SERIOUS RISKS ON REVENUE PERFORMANCE, STABILITY and INTEGRITY of the OVERALL SOUTH AFRICAN METERING SYSTEM.

The Midrand POWER CONFERENCE (Feb 2001) has made it abundantly clear that Central Government and its many Advisory Agencies have little understanding as to how indecision at top level, growing uncertainty and low moral at ground level pose serious risks on revenue performance, stability and integrity of the South African electricity metering system.

Whilst AMR (Automatic Meter Reading) has taken the *electrified* (Western) countries by storm, the situation in South Africa is very different. 51% (and growing) of South Africa's domestic single-phase meters are prepayment (i.e. 3.5 million one-way prepayment meters). In global terms it means that more than 90% of one-way prepayment meters World wide, are installed in South Africa and spilling over in the *electrifying* countries in Sub-Saharan Africa (Windhoek 16,000 and Tanzania 40,000 meters)

Everything is not well with the South African electricity metering system and in particular not with prepayment metering.

There are major differences in revenue performance of metering systems and as a direct result of major discrepancies in price and management policies and procedures governing these metering systems (in particular policies or non-policies on *Revenue Loss Control* and *Operational Management*). Financial failures seem to outnumber the successes. Whilst there are prepayment meter systems running at annual revenue levels of R1.2m/1000 meters with tamper levels below 1.5%, there are more metering systems (with the same consumer profile) not achieving R 0.2m/1000 meters.

Apparently with consent of the National Electricity Regulator (NER) some prepayment metering systems are used (and miss-used) to collect arrears. A system whereby 50% (and more) of the prepay purchase is taken upfront as down payment on debt or arrears. Effective tariffs on these prepayment systems range from 22 c/kWhr for the rich to as high as 80c/kWhr for the poor. The system of using the prepayment purchase to collection arrears has not only failed lamentably, it renders electricity un-affordable, the prime cause for tampering.

Recent election promises of ***free electricity*** (later quantified as 20 units or R 5 /month and now at 50 units/month) will, by the nature of prepayment revenue collection, render useless any form of Loss Control. The BESST will indeed be in violation of new *Credit Control Legislation*. Should this policy be enforced Municipal Finance Officers has (and will) simply increase overall tariff structure to make up for losses (and possibly more) because for most Municipalities electricity is the prime (or only) source of income.

Not making things any easier is the fact that new legislation i.e. *The Electricity Act* and *The Systems Bill* (on Credit Control) directly contradict each other on important aspects of revenue management on prepayment systems.

Apart from current restructuring efforts, a process of political transformation at the Municipal and Regional levels has been going on for some years now. Dedicated and experienced Administrators and Engineering Managers now find themselves in 'temporary appointments' carrying work and responsibility loads beyond the call of duty. An alarming number of Specialists have already left the Industry, some of them indeed of the World's finest in the fields of Generation, Transmission, Protection, Revenue Management and Operational Management. The final price of which has yet to be determined.

Vacancies in *key-performance-areas* on the operations level remain frozen. Engineers have no other option than to call-off or to postpone basic and critical operational duties such as audit trails, optimisation, staff training and electrification. Since the introduction of prepayment meters in 1992, most prepayment metering systems in South Africa have completely outgrown the logistics for its management. Not only *shortage of manpower* (in some cases one skilled technician per 10,000 meters) but also in *lack of skills* given ever changing metering technology. Excessive use of *free-units-issues* and high meter replacement rates (annual replacement indices of 4 to 7%) are indicative of the problem. More alarming is statistics from Manufacturers indication that 83% of *'failed meters'* sent for repairs are reported *'nothing wrong with meter'*.

4. INADEQUITE INFORMATION TECHNOLOGY TO SUPPORT OPERATIONAL PROCESSES. FROM 1st to 2dn and 3rd GENERATION VENDING SOFTWARE.

The single most critical problem on the operational level today is the absence of quality information support. Prepayment Vending-software was designed fundamentally as revenue collection tools and not to model operational practices or to measure performance on this level. The result today is that many prepayment meter systems are in a bad state of uncertainty. For one, tampering statistics is reported completely wrong. National tamper figures of 5 to 15 % may in fact not be more than 2 to 3%. Less than 63% of meters can be located from Vending Software database records. 15% of meters of these records are in fact already replaced, with no indication of which installation basis are responsible for consuming meters rather than units. Meter replacement is the prime driver of operating costs.

Vast amount of prepayment transaction and meter data records more or less useless for even the most basic of statistical analysis. ***After 10 years of prepayment metering in South Africa, this unique method of electricity dispensing has yet to find a scientific base for its understanding.***

Most Engineering Managers today rely on 'here-say-reports' and good old 'gut-feel' to manage things. In some cases the only option is 'unexpected sweep through' in areas suspected of high tampering. In others, Engineers have sought to develop and install (at huge cost) the ultimate and foolproof technological solution. These 'hard' management approaches are not well received by Communities and has resulted in situations where it has become very difficult to normalise things. In some cases Field Technicians must be accompanied by armed security.

Understandably so, and given that the demand for new meters has reached saturation levels, most Metering Companies and Software Service Providers are reluctant to invest in solving the IT problem. New 2nd generation vending software systems unchanged in basic data model design are but bad modifications of 1st generation versions. The focus was on software integration, the *e-payment;* interfacing with Billing Systems and enhancement of financial capabilities (flexible tariff scales, poverty tariff, debt collection and prepayment services) and to provide for both the electricity and water prepayment meter.

Even with grand GIS (Geographical Information Systems) around, Field Operations and Revenue Loss Control processes has yet to find desperately needed information technology support. In fact, IT support systems at most Engineering Departments today (badly designed vending software systems, unfriendly or non-access to data on Billing Systems and spreadsheets and more spreadsheets) indeed makes true the old systems truth of *'bad systems breed more systems'*.

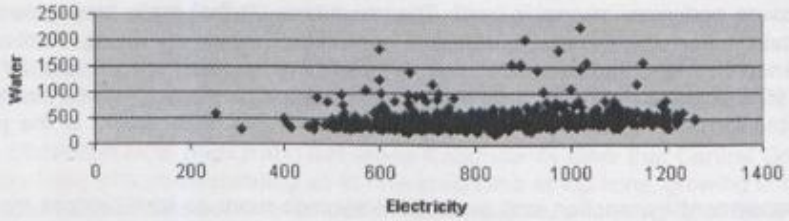
Whilst our Metering Companies must receive all credit for greatly improving cost, reliability and functionality of the prepayment meter over the past 6 years (some adhering to the STS standard and some not), there seems to be un-willingness to endeavour in a collective effort to solve the IT problem. Instead, local Metering Companies guard (and quietly expanding) their proprietary milking cows in the field. Market shares are still measured in *numbers of proprietary* and in some circles the issue of *proprietary* is confused with *intellectual property.*

Proprietary vending software each with its own understanding of Operational Management and Billing Software Providers just avoiding the problem is in fact one of the root causes for poor revenue performance of metering systems.

The minimum requirement for 2nd generation vending software is that it must be ***base-driven*** (not meter driven). Moreover, it must facilitate:

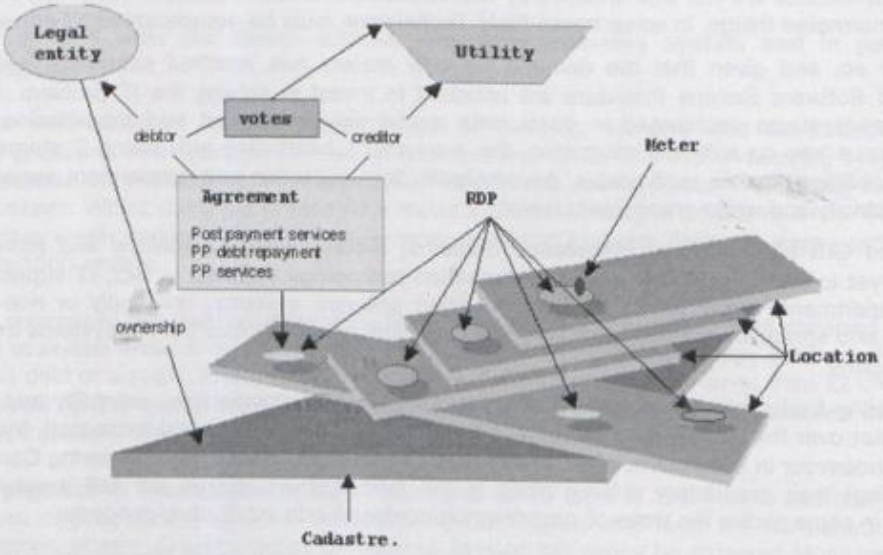
- processing of application for a RESOURCE DISPENSING POINT (RPD) or POC (Point of Connection).
- reporting the consumption behaviour of RDP's regardless of meter replacement on such RPD's.
- reporting Operational Reliability of both RPD and METER.
- advance statistical data mining to identify troubled RPD's.
- METER-LIFE-CYCLE_TRACKING.
- basic project management and control on the payment of Installation Contractors.
- Recording, allocation and control of Maintenance calls.

What is needed is 3rd generation or INTERGRATED software solutions which focuses on LEGAL ENTITIES i respect of the full scope of services (or RDP's) offered i.e. electricity, water, telephone, sewerage, refuse and rates I.e. comparing the consumption of metered electricity with metered water as the only effective mechanism to identif sophisticated tamper.



The graph above shows monthly payments in Rands of metered electricity compared to metered water. Exception are clearly visible.

The implementation of 3rd generation software solutions requires a complete redesign of all existing software systems. The basic requirements for its data model as demonstrated below:



Most of all, the implementation of 3rd generation software solutions require from Industry not to segregate service In short, proposed restructuring business models suggest the segregation of electricity from other services and whic may render INTEGRATED RESOURCE MANAGEMENT impossible.

5. OUTSOURCING NOT AN OPTION ANYMORE BUT THE ONLY OPTION. THE PRICE OF DOMESTIC ELECTRICITY IN SOUTH AFRICA MAY INCREASE BY 150% AND MORE.

Whilst the restructuring debate continues and whilst expensive Financial Consultancies do and re-do their calculations, the result of indecision, poor leadership and growing uncertainty on ground level may not come cheap.

It does not require much insight to foresee that the South Africa Electricity Industry characterised by the absence of Specialists, poorly staffed Field Operations in over sized metering systems with bad information technology support combined with growing uncertainty and low moral will soon call for grand *outsourced management solutions*. Outsourcing is no longer an option anymore. In some cases it has become the only option.

Whilst the 'direct operating cost' of prepayment metering systems can be kept below 10% of revenue, there are badly controlled *outsourced management solutions* currently running on South African metering systems at 25% (and more). If grand turnkey projects by European Multinationals such as in Cote D'ivoire (Ivory Coast) and Mozambique could serve as indicators, the end consumer price of electricity on these systems has reached the levels of R1.25c per unit (compare with current average domestic price below 30c/unit in South Africa).

The Market place however, is preparing for this. New *Solution Providers* have emerged and previous Suppliers of good meters and bad vending software has now adopted new mission statements reading 'Revenue Management', 'Revenue Loss Control Management'. The presence of new competitors from Europe is indicative of the potential for big business coming. The cost of which ultimately will have to be carried by the end Consumer.

Large scale 'Outsourced Resource Management Solutions' will have major cost and possibly employment implications. It has the potential to increase the price of electricity in South Africa to the same levels as in Europe and elsewhere i.e. price increases of 150% and possible much more.

It is not only the price tag associated with inevitable *outsourcing* but there are hidden drivers of costs and merely as result of restructuring itself. The VAT problem and *Ring fencing* of Generation, Transmission and Distribution (*as the first logical step in economic restructuring*) may very well come up with a surprising new wholesale price for electricity.

What also needs to be corrected is the fact that current price of prepayment electricity (i.e. 48% of South Africa's single phase users) are heavily subsidised by Commercial and Industrial Users given also that 30% and more of current prepayment meters are installed with the wealthy middle class.

6. CRISIS OR OPPORTUNITY. THE SOUTH AFRICAN ELECTRICITY INDUSTRY IS AT A CROSS ROAD.

Electricity is an economic multiplier. It is the engine for growth, development, and prosperity in Sub-Saharan Africa. Providing affordable and available electricity on a sustainable basis involves delicate and complex engineering, economic, social and ecological processes. Continued improvement and optimisation of systems, processes and techniques rely on experience, knowledge and the rules of Science. It can never be dictated by political or personal agendas. ***Careless political interference in the fragile electricity revenue systems of South Africa will have to be stopped.***

As deregulation in Europe and USA has shown, things can take on a momentum and direction of its own. Sometimes achieving the opposite what was set out to do apart from the fact that things can go very wrong indeed. Restructuring of the South African Electricity Industry is subject to the same risks and possibly much worse.

Current restructuring of the South African Electricity Industry calls for high-level intervention. ***This paper calls for the termination or delay of current restructuring efforts*** because it has become a stage play of political and personal agendas. It is unclear in its objectives, unable to make decisions and there are too many Advisory Agencies and expensive Financial Consultancies not knowing how to advise. Current restructuring program is not addresses the right issues and has thus far achieve nothing other than to weaken the fragile electricity revenue systems to the point of near collapse.

The time has come to re-think the wisdom of restructuring. To ***"first do the right things before doing things right",*** to define the real problems (i.e. the bad logistical situation on ground level, bad IT support and low worker moral) to access risks and to seek for management solutions within the boundaries of South African metering systems and with available Metering and Information Technology.

The responsibility of ensuring and enhancing the stability; integrity and revenue performance of metering systems rests with Organised Industry i.e. ESKOM, AMEU (Association of Municipal Electricity Undertakers), IMFO (Institute of Municipal finance Officers), SARPA (South African Revenue Protection Association), The STS Association, Organised Regional Structures, Consultancies, Community Leaders, Metering Manufacturers and Software Service Providers.

It is the duty of Political Leadership to support and to protect the revenue processes, to assist in formulating an appropriate VISION and MISSION, which reflects the needs and the democratic spirit of the South African Nation.

Not to interfere and not to prescribe but to create a climate in which Organised Industry and its Customer base can mould the future of the Electricity Industry of South Africa.

In the Chinese language the word for ***crisis*** and the word for ***opportunity*** are the same word. It reminds of the words of Wolfgang Grulke. ***'No longer can we afford to seek sanctuary in what we know, or what has gone before. We need to learn from what's going to happen; we need to absorb and apply lessons from the future***'.

Future successes will seek from role players to take on completely new roles and responsibilities. Achievements no longer measured in political or monetary gains but rather in quality and value to be added. The key is partnership and communication, standardisation of best practices and decision-making based on scientific understanding of the character and behaviour of electricity revenue systems.

2001-10-11 **Eiportne Systems Engineering** eiportne@mweb.co.za +27 83 461 4816

TRANSPARENCY IN THE SUPPLY INDUSTRY

Danie van Wyk – Pr. Eng; B.Eng; Hons B.Com - City Electrical Engineer of uMhlathuze

BACKGROUND AND PROBLEM IDENTIFICATION

There are various interpretations and standards applied by the supply authorities and distributors when costing new or increased electricity supplies to customers. This paper addresses some of the different approaches to service connection costing and recommends a methodology to establish transparent and justifiable connection costs in the supply industry that will ensure sustainability and fairness in the short, medium and long term.

DEFINITIONS

In assisting to fully understand the detail of this paper, it is important to define some concepts and terminologies that will be used. For the purpose of this presentation, these are defined as follows:

Supplier's network - The total electricity network and equipment of the organization supplying power to the distributor from generation to the point of delivery (POD). This network is the property of the supplier. The cost thereof is either paid upfront or charged by means of a monthly extension charge or may form part of the tariff structure charged to the distributor.

Primary Network or "*Backbone*" - The part of the electricity network and equipment that belongs to the distributor and is utilized to distribute electricity to all its customers. All customers thus have benefit from this network.

Secondary network - The part of the electricity network and equipment that is shared by a limited number of customers.

Service Connection - The part of the electricity network and equipment used to supply a single customer and thus only one customer benefits from this network.

Engineering contribution - The pro-rata cost to be paid by a developer to connect a new development or to provide for additional requirement for services to an existing infrastructure. This cost is based on the nett present replacement value of equipment being or to be shared by more than one customer.

DISCUSSION

Electricity tariffs

The recent trend in the EDI to rationalize electricity tariffs and to drive to a cost of supply scenario is one of the fundamental and first steps towards transparency. A cost of supply study has been dealt with in detail by ESKOM and the principles are used as some of the basic tools to determine or evaluate tariffs in the future development of the restructuring process.

The electricity tariffs of a distributor's demand and energy charges can be split into four main components. They are as follows:

1. The *input cost component* refers to the charges to the distributor for purchasing or generating electricity.

   This component is a given and the distributor has limited control except to increase both its load and power factors to influence and reduce this cost by DSM or other means. These limits are normally very tight and are very dependent on especially large customers' cooperation and performances.

2. The *profit component* refers to the profit made by a distributor when trading electricity. This component is acknowledged and should be limited to ensure sustainability of both distributor and customer and at the same time be competitive in the market. This component includes the local government levy.

3. The *operational costs component* refers to the expense incurred by the distributor to operate, maintain and meet its obligations. This also includes the levy to the local authority.

All three the above components will not be further addressed in this paper but could be the subject of future papers.

4. The *capital costs component* refers to the expense incurred by the distributor taking up loans to provide infrastructure to service future and/or existing customers.

The *capital component* is required to cover interest and redemption of the distributor's capital layout. The paper will focus on this component and address effective means to limit its impact. It will also make recommendations to adopt a methodology to have transparent costing with limited cross subsidizing.

The capital expenditure normally represents all outstanding loans taken up or to be taken up in terms of the approved capital budget during a specific financial year to finance fixed assets, electricity networks and purchases of equipment required by the distributor to meet its obligations. This is inter-alia for the expansion, upgrading or replacement of networks and is thus a mix of new capital investment and replacement of existing infrastructure or equipment. It is therefore the responsibility and should thus be the prime objective of a sound management to reduce and limit the outstanding loan amounts to ensure the lowest interest rates are charged. Limiting the outstanding loans implies maximum utilization of available networks and equipment by following the shortest possible cable routes, have the least possible "spare capacity" in the system, operate with fit for purpose equipment and ensure optimum utilization.

When referred to "spare capacity", it includes all aspects of the electricity networks and not only transformer capacities e.g. under-utilized reticulation, over-designed or specified equipment, pre-mature installations, etc.

Survey

A survey was conducted with a number of supply authorities to establish the present approach and costing of pre-defined examples for new and existing supplies that require upgrading. The following examples were used to request the connection costs from various distributors:

1. A standard 60 Amp single phase domestic connection in and established township.

2. A second 60 Amp single phase domestic connection (for granny flat) in and established township.

3. A 200 kVA; 400 Volt new connection to a 1 000 sq m vacant stand being zoned "Business with F.A.R. = 0.6" in the established CBD area. A 500 kVA Mini-sub with reserve capacity is adjacent to boundary.

4. Upgrading of an existing 200 kVA; 400 Volt connection to an 800 kVA supply on a 1 000 sq m stand being zoned "Business with F.A.R. = 0.6" in the CBD. The existing 500 kVA mini-sub is adjacent to stand boundary and will need upgrading or additional transformer to be installed.

5. A 500 kVA; 400 Volt connection to a 1 500 sq m vacant stand being zoned "Industrial with F.A.R. = 1" in the established Industrial area. A 500 kVA mini-sub with reserve capacity is 100 m from boundary.

6. Upgrading of an existing 500 kVA; 400 Volt connection to an 800 kVA supply on a 1 500 sq m stand being zoned "Industrial with F.A.R. = 1" in the established Industrial area. The existing 500 kVA mini-sub & 11 kV cable are 100 m from the stand boundary and will need upgrading or additional transformer to be installed.

7. A 1 500 kVA; 11 kV connection to a 4 000 sq m vacant stand being zoned "Industrial with F.A.R. = 1" in the established Industrial area. 11 kV with reserve capacity is 100 m from boundary.

8. Upgrading of an existing 1 500 kVA; 11 kV connection to a 2 500 kVA supply on a 4 000 sq m stand being zoned "Industrial with F.A.R. = 1" in the established Industrial area. The 11 kV cable is 100 m from the stand boundary and will need upgrading or a new ring to be installed. The main substation with capacity is 1 km away.

Table A gives the comparison of the final costs.

TABLE A

Connection cost comparison Connection	Credit kVA	Costing	Richards Bay	Pietermaritzburg	Durban	Pretoria
1 60A single phase Domestic connection	**13.8**	Material & labour	R 1,015	R 1,933	R 1,201	R 505
		Basic Charge			R 3,645	
		VAT	R 142	R 271	R 678	R 71
		Total	**R 1,157**	**R 2,204**	**R 5,524**	**R 576**
2 Extra 60A single phase 2nd Domestic connection	**13.8**	Material & labour	R 1,015	R 536	R 1,201	R 505
		Eng Contribution / Basic Charge	R 6,296		R 3,645	R 5,992
		VAT	R 1,024	R 75	R 678	R 910
		Total	**R 8,335**	**R 611**	**R 5,524**	**R 7,407**
3 200kVA, 400V on 1000 sq m Business connection	**48**	Material & labour	R 6,380	R 4,608	R 13,850	R 9,190
		Eng Contribution / Basic Charge	R 106,552	R 10,743	R 37,875	R 44,905
		VAT	R 15,810	R 2,149	R 7,242	R 7,573
		Total	**R 128,742**	**R 17,500**	**R 58,967**	**R 61,669**
4 800kVA, 400V on 1000 sq m Business upgrade	**200**	Material & labour	R 12,272	R 10,365	R 28,318	R 61,956
		Eng Contribution / Basic Charge	R 420,600	R 24,698	R 37,540	R 78,596
		VAT	R 60,602	R 4,909	R 9,220	R 19,677
		Total	**R 493,474**	**R 39,972**	**R 75,078**	**R 160,230**
5 500kVA, 400V on 1500 sq m Industrial connection	**60**	Material & labour	R 12,502	R 9,587	R 27,650	R 69,599
		Eng Contribution / Basic Charge	R 308,440	R 30,995	R 62,200	R 131,305
		VAT	R 44,932	R 5,682	R 12,579	R 28,127

It is clear from the final values that there are different approaches and assumptions to the costing of the connections.

Methodology

The most elegant way to establish the actual cost for a distribution network and supply is to break it up into logic and easy identifiable building blocks. Each of these building blocks are then costed at nett present replaceme values and divided by the full relevant specified capacity / rated value of that equipment to obtain a cost per kVA. diversity factor of 15% is applied at each voltage level to give benefit of diversity through to the customers an prevent a double-charge.

It will be noted that the full capacity / rating of the equipment is used and not the firm capacity to ensure no doub charges on "spare capacity".

The first step is to define the interface between the supplier's network and the distributor's network. The next step is to differentiate between the primary and the secondary networks and further distinguish this from the service connections.

The customers will be required to pay 100% of all costs of networks and equipment utilized for its sole purpose and contributes towards the shared networks and equipment on a pro-rata basis. The primary network or "backbone" costs as well as the cost related to the supplier's network (non-rebateble monthly extension charges, etc.) are shared by all customers and will be recovered in the electricity tariffs.

The details of engineering contributions can best be illustrated using examples.

Table B shows the typical results of a distributor taking supply at 132 kV and Table C shows the typical results of a distributor taking supply at 11 kV.

The primary network of the distributor of Table B is considered as the 132 kV overhead lines connecting the major 132/11 kV substations and excludes the substations.

There is no distributor owned primary network for the distributor of Table C where all customers are connected to common equipment. The upstream 132/11 kV or 88/11 transformers are normally owned, operated and maintained in this case by the supplier (ESKOM) and its costs are taken as either being paid upfront by the distributor or charged on a non-rebatable monthly extension charge. This will thus form part of the input cost component (purchase account) and must not be calculated to avoid double charges.

It is important to ensure consistency to apply the same principles and basis of costing when assessing the cost of a new township development, a new service connection or an upgrade of an existing supply. It is also important that a clear distinction between the responsibilities for the township developer, who creates new stands/erven and the property developer, who develops a vacant erf, be made and raise the correct charges. The latter is regarded as the developer who rezone a property/s or erect structures onto it.

The towhship developer who creates new erven must be responsible for the infrastructure and reticulation to have a supply available to each new individual erf. When developing non-domestic erven, a minimum level of services that must be within reasonable norm have to be provided. From practice and statistical assessments, the following are regarded as reasonable and practical average requirements:

Zoning	**ADMD factor**
Business or office or equivalent	80 VA/sq m = 0.08 kVA/sq m
Light industrial or equivalent	40 VA/sq m = 0.04 kVA/sq m
Medium and heavy industry	No services in sale price but developer of the erf will be responsible for the cost of all services

The minimum level of service is calculated by the following formula to take full cognisance of a specific property's zoning:

kVA = ADMD factor (as above) x area of erf (sq m) x floor area ratio (FAR)

When assessing an upgrade of supply, the maximum value of either the *calculated kVA* or the value of the *existing supply* is taken as a credit to prevent the developer from not being double-charged. It is further very important to ensure that engineering contributions are charged when properties are rezoned and likely to require an increased demand, hence ensuring consistency.

The best tool to ensure that developers limit their notified maximum demand when applying for a service connection, is to directly link the stated demand to both the cost of the connection and the consumption deposit. In this way both the supply authority and all its customers reap the benefits of having limited unused or "spare capacity" in its systems.

GUIDELINES AND PITFALLS

Beware of the following pitfalls when establishing your engineering contribution charges:

1. Ensure you have defined the correct interface between the supplier and the distributor. (Do not add the supplier's networks to the cost.)

2. **Clearly identify the primary networks or backbone and separate this cost from the rest of your networks.**
3. Ensure to have all costs of all relevant systems included i.e. 11 kV cable with both circuit breakers an associated building/s.
4. Base the costing on justifiable principles for all customers to see that they are treated fairly.
5. Act in the interest of both your organization and the customer / developer.
6. Do not detail to the extyend that the methodology becomes too complicated to explain to a non-technic person (normally the customer). **KIS = keep it simple!**

CONCLUSION AND RECOMMENDATIONS

When applying this methodology of a consistent and justifiable approach to new developments and custom connections where the interests of both parties are protected, an optimum solution and mechanism can b developed and implemented. This will ensure controlled NMD applications, minimum spare capacity, optimu utilization of capital investment and limit inflated electricity tariffs.

Work towards the goal whereby the capital component in the demand and energy charges are limited to only mak provision for:

1. Capital costs of the primary supply network or "backbone" and
2. Spare capacity.

ENGINEERING CONTRIBUTIONS FOR 132kV INTAKE				DOMESTIC					NON-DOMESTIC									TABLE B
Description	Size	Amount	Base	Tariff	230 V	230 V	230 V	400 V	400 V	11 kV	11 kV	11 kV	11 kV	132 kV	11 kV	11 kV	132 kV
Diversity	15%		date		Low	Medium	High	High	All areas	On Back Bone	On Back Bone	On Back Bone	On Back Bone	On Back Bone	Off Back Bone	Off Back Bone	Off Back Bone
Escalation	0.02%		Jul-01	(R /kVA)					(Mini)	(Switch Station on ring)	(Switch Station)	(Main sub on ring)	(Main Sub)	(Main Sub)	(Main sub on ring)	(Main Sub)	(Main Sub)
132 kV Sub (Basic incl. earthing, batt)	100,000	R6,957,578	Jan-01	R72	0.7	0.7	0.7	0.7	0.7	0.85	0.85	0.85	0.85	1	1.7	1.7	1
132 kV Bay in Sub	100,000	R1,165,347	Jan-01	R12											3.4	3.4	4
12 km ;132 kV Transmission line	100,000	R5,744,514	Jan-01	R60											1.7	1.7	1
3 x 132 kV Transformer Bay in Sub	60,000	R3,485,708	Jan-01	R60	0.85	0.85	0.85	0.85	0.85	1	1	1	1		1	1	
3 x 132 / 11 kV Power transformers	60,000	R6,191,608	Jan-01	R107	0.85	0.85	0.85	0.85	0.85	1	1	1	1		1	1	
11 kV switch room	60,000	R331,414	Jan-01	R6	0.85	0.85	0.85	0.85	0.85	1	1	1	1		1	1	
11 kV switchgear + Incoming cable	60,000	R392,867	Jan-01	R7	0.85	0.85	0.85	0.85	0.85	1	1	1	1		1	1	
3 km ;11 kV Main Feeder	15,000	R815,982	Jan-01	R57	0.85		0.85	0.85	0.85	1	1						
11 kV switchgear & Solkor	15,000	R326,393	Jan-01	R23	0.85		0.85	0.85	0.85	1	1						
11 kV Switching Station	15,000	R346,210	Jan-01	R24	0.85		0.85	0.85	0.85	1	1						
11 kV switchgear	6,000	R119,677	Jan-01	R21	0.85	0.85	0.85	0.85	0.85	1		1			1		
6 km ;11 kV Cable Ring	6,000	R1,495,967	Jan-01	R259		0.85	0.85	0.85	0.85	1		1			1		
6 km ;11 kV O/H Line Ring	5,000	R623,143	Jan-01	R130	0.85												
500 kVA Minisub/200 kVA pole Tx	500	R81,996	Jan-01	R171		1	1	1	1								
100 kVA pole Tx	100	R13,719	Jan-01	R143	1												
U/G LV Reticulation	4	R3,356	Jan-01	R873		1	1	1									
O/H LV ABC Reticulation	2	R630	Jan-01	R328	1												
2001/2002Tariff (R/kVA)					**R890**	**R1,486**	**R1,573**	**R1,573**	**R701**	**R625**	**R345**	**R522**	**R242**	**R72**	**R726**	**R446**	**R181**
ADMD					1	2.5	4	8	500	500	500	500	500	5,000	500	500	5,000
Total					R890	R3,714	R6,294	R12,587	R350,265	R312,666	R172,581	R261,039	R120,954	R361,955	R363,222	R223,137	R903,304

ENGINEERING CONTRIBUTIONS FOR 11kV INTAKE

DOMESTIC | **NON-DOMESTIC** | **TABLE C**

Description	Size		Amount	Base	Tariff	230 V	230 V	230 V	400 V	400 V	11 kV	11 kV	11 kV	11 kV
						Low	Medium	High	High	All areas				
Diversity	15%			date						(Mini)	(Switch Station on ring)	(Main sub on ring)	(Switching Station)	(Main Sub)
Escalation	0.02%			Jul-01	(R/ kVA)									
132 / 11 kV Power transformers	40,000	1,200,000	R3,600,000	Jan-01	R94	0.85	0.85	0.85	0.85	0.85	1	1	1	1
11 kV switch room	60,000		R331,414	Jan-01	R6	0.85	0.85	0.85	0.85	0.85	1	1	1	1
11 kV switchgear + Incoming cable	60,000	87,304	R392,867	Jan-01	R7	0.85	0.85	0.85	0.85	0.85	1	1	1	1
6 km ;11 kV Main Feeder	15,000	272	R1,631,964	Jan-01	R113	0.85		0.85	0.85	0.85	1		1	
11 kV switchgear & Solkor	15,000	72,532	R326,393	Jan-01	R23	0.85		0.85	0.85	0.85	1		1	
11 kV Switching Station	15,000		R346,210	Jan-01	R24	0.85		0.85	0.85	0.85	1		1	
11 kV switchgear	6,000	59,839	R119,677	Jan-01	R21	0.85	0.85	0.85	0.85	0.85	1	1		
6 km ;11 kV Cable Ring	6,000	249	R1,495,967	Jan-01	R259		0.85	0.85	0.85	0.85	1	1		
6 km ;11 kV O/H Line Ring	5,000	104	R623,143	Jan-01	R130	0.85								
500 kVA Minisub/200 kVA pole Tx	500		R81,996	Jan-01	R171		1	1	1	1				
100 kVA pole Tx	100		R13,719	Jan-01	R143	1								
U/G LV Reticulation	4		R3,356	Jan-01	R873		1	1	1					
O/H LV ABC Reticulation	2		R630	Jan-01	R328	1								
2001/2002Tariff (R/kVA)						**R807**	**R1,354**	**R1,490**	**R1,490**	**R617**	**R525**	**R366**	**R266**	**R106**
ADMD						1	2.5	4	8	500	500	500	500	500
Total						R807	R3,386	R5,961	R11,921	R308,640	R262,736	R182,809	R133,028	R53,101

Piloting STS 2000

By Roland Hill, Circuit Breaker Industries (Pty) Ltd

Synopsis

This paper reviews the process and progress made during the collaborative effort to introduce complex tariff capabilities into industry standard STS pre-payment meters. It describes the myriad of logistic and political issues invoked by such incremental technological advances and it motivates the establishment of a regional forum to plan a second generation of "meters". Free Basic Electricity provision via Static Tokens is compared with the Two-Part Tariff method of STS 2000. In conclusion, emerging needs shaping future STS "service interface devices" are presented.

1. *Introduction*

Pre-payment metering was pioneered by Don Taylor and Rudi Coetzee way back in 1985. By 1990, more than a million proprietary meters had been installed by an enthusiastic industry. The need for standardization was soon recognized and the Standard Transfer Specification (STS) was defined and completed by 1993. In parallel, a variety of supporting standards were also defined to deal with related system issues. Standards such as NRS 009, MC171, MC102 and SABS 1524 became part of the industry initiative. Since then, the STS technologies have matured into a global industry and the International Electrotechnical Commission (IEC) has recognized the standards. Figure 1 shows this hierarchy of standards as they relate to Company, Association, National, Regional and International levels.

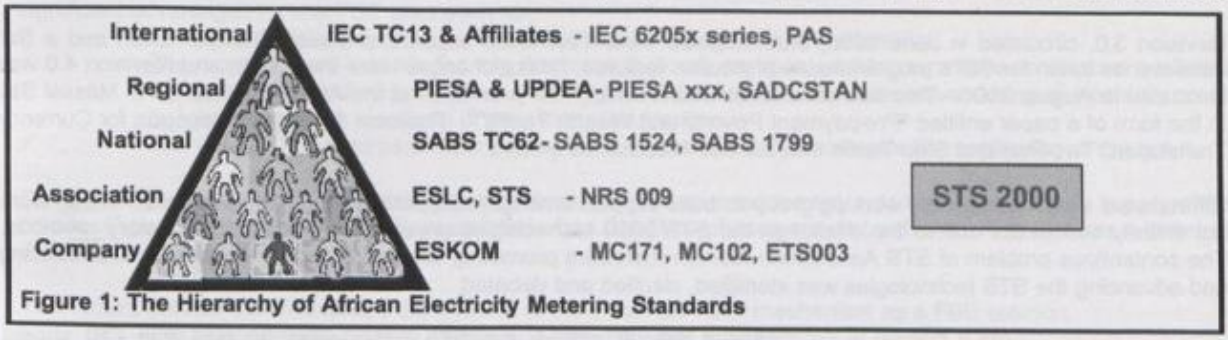


Figure 1: The Hierarchy of African Electricity Metering Standards

Ownership of the STS technologies was transferred to the STS Association in 1997. Two working groups have since been established to enhance the specifications in response to market needs. WG1, mandated to improve vending technologies, is focused on key management and vending security issues. WG2, mandated to enhance meter related technologies, has concentrated on the addition of complex tariff capabilities. Participation costs are borne by the parent companies and motivated on the basis of mutual self-interest. User needs are formulated and tested via the STS User Group. (www.sts.org.za/usergroup)

WG1: VENDING ENHANCEMENTS	WG2: METER ENHANCEMENTS
> Secure module alternatives	> Complex tariffs
> Global key management centers	> Two way tokens
> Vending credit management	> Multi-utility meters
> Vending key base date	

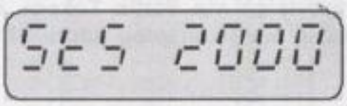
Figure 2: Activities of the STS Association's working groups

The STS Association has prepared an ambitious business plan to promote its technologies to the global electricity supply industry, and to enhance the professionalism of the organization. New funding methods, necessary for the added capabilities, are under consideration. Lingering intellectual property claims are being dealt with in accordance with internationally accepted practices. The STS Association thus has much to offer to the industry. Utilities and interested parties are urged to view the website (www.sts.org.za), and consider registration as members.

This will ensure that your interests are served and that you are kept informed of all new developments.

2. Development of STS 2000 by WG2

Under the capable leadership of Stephen Leigh of Contour Systems, WG2 prepared an initial draft in February 1999. This was basically a review of anticipated developments raised as STS * by Johan Bezuidenhout in 1996. Thirty-one requirements were ranked into immediate, future and additional categories. Circuit Breaker Industries (CBI) raised a further sixteen suggestions and a second draft was formulated in October 1999. Discussion and debate then focused the issues onto four immediate requirements, which were compiled into a third draft in November. This was then formalized and released for comment as Revision 1.0 in December 1999. Under consideration at that time were;



Extension of tariff functionality
Implementation of a secure real time clock
Improved credit management
Vending key base date

Consideration of comments received focused thinking onto the extension of Tariff Functionality and Revision 2.0 was circulated in May 2000. This gave the first definition of the Two-Part and Step Tariff implementations. Support for three steps was proposed at that time. Correspondence amongst the working group members clarified technical inconsistencies and raised the issue of product marking/identification to users in the field. Enhancements to the type testing procedures were also contemplated and the need for an enhanced version of the STS Simulator, a critical development tool, was identified. It became apparent that the introduction of enhanced product into the market would require careful planning and that it should only occur in limited and controlled stages. Thus all potential changes should be advanced.

Revision 3.0, circulated in June 2000, thus included Tariff Test token support, a Disable Tamper token and a Set Accessories token for CBI's programmable protection features. Minor changes were then made and Revision 4.0 was circulated in August 2000. This was considered stable enough for promotion at the AMEU conference in Mossel Bay in the form of a paper entitled "Pre-payment Poverty and Wealth Tariffs"[1]. Revision 4.0 provided support for Currency Translation, Two-Part and Step Tariffs and the Set Accessories feature.

Efforts were also made by the working group to build support amongst non-participating manufacturers. These were not entirely successful due to the challenge the STS 2000 technologies presented to existing proprietary methods. The contentious problem of STS Association founder members promoting competing technologies without embracing and advancing the STS technologies was identified, clarified and debated.

After a difficult period, the STS Association decided that CBI should continue to use its resources to implement and pilot the technologies on behalf of the industry. CBI was asked to share the results with the STS Association members whereupon, ratification of the specification would be considered according to criteria still to be established. The STS Association elected that in its role as a custodian of a transfer specification it was not in the business of funding and piloting the development of advanced product capabilities. CBI committed to further the development of STS 2000 in a responsible manner.

3.0 EBSST, FBE and Two-Part Tariffs (TPT)

During the year 2000, political awareness about the advantages of using cross-subsidized energy grants to the poor, grew rapidly. The limited implementation and reach of existing Indigent Support programs were dramatically transformed by President Mbeki's announcement of an Electricity Basic Services Support Tariff (EBSST) amounting to 50kWh per poor household per month. An apprehensive Electricity Supply Industry grappled with the daunting challenges presented and high-level workshops were held to find solutions to a diversity of technical, political and economic problems.

It was immediately apparent that nationwide implementation required standardization of policies, equipment and implementations, in order to prevent conflict arising from inconsistencies. It was quickly realized that the solution had to be implemented on the existing installed base of meters by modification of the vending and billing systems. Conventional billed consumers were easily accommodated. Existing STS standardized prepayment meters could be accommodated by the addition of new Static Token definition that required the upgrading of all vending equipment in

the field. Regrettably, squabbles about patent rights did little to endear vending suppliers to an exasperated and increasingly desperate Municipal audience. This however, was eclipsed by the problems of Utilities with proprietary pre-payment meters. In such cases, technical solutions were mostly not possible or viable and the proprietary meters had to be scrapped and replaced with STS meters. Important (expensive) lessons learnt from this exercise were;

- Alteration of tariff structures has enormous, unforeseen consequences that require sophisticated pre-implementation research.
- National tariff definitions cannot accommodate the diversity of community needs and situations.
- Strict adherence to industry standards has substantial benefits beyond simple economies of scale.
- Competition between Suppliers delays solutions unless Users collectively direct outcomes.

Free Basic Electricity (FBE) policies now being implemented at Local Government level are far more adaptable to specific needs of communities. Much however, has still to be learnt about the effectiveness of these welfare actions. Serious concerns about the economic viability of such grants in marginal (rural) communities still have to be answered. Clearly, the success of such policies is critically dependant on the effectiveness of the implementation. Noted limitations to the FBE methods are;

- The cost of collecting a Static Token might be prohibitively expensive in remote areas.
- The collect it or lose it policy may cause anger if vending availability is problematic.
- Costs associated with vending and auditing Static Tokens could be substantial.
- The management, marketing, training and support costs could be problematic.

STS 2000 presents an elegant alternative via the Two-Part Tariff (TPT) mechanism. Vending of Static Tokens is thus not necessary because the TPT capability can be set to allocate the desired quantity of free electricity. This is done via the Hourly Credit and Credit Threshold Tokens, which are typically set during manufacture. The TPT method has significant advantages in rural FBE sites such as;

- ✓ The vending, token collection and Static Token auditing costs are eliminated.
- ✓ The monthly grant is trickle fed into the meter in hourly portions, which guarantees continuous availability. Consumers dependent on the free electricity are thus protected from the squandering of electricity credits by less responsible members of their extended families.
- ✓ The Credit Threshold parameter can be used to automatically administer the application of the grant.

Consumers purchasing credit (indicating the availability of financial resources) automatically halt their supply of free credits. Free credits are automatically re-instated when Credit purchases are discontinued. This ensures a better use of limited welfare funds.

Two factors prevent the widespread deployment of the Two-Part Tariff mechanism as a FBE solution.

- It is only available on new meters and from only one manufacturer at present (CBI).
- Consumers forced to collect Static Tokens will resent the convenience offered to those with TPT.

It is recommended that the application of STS 2000 Two-Part Tariffs should initially be constrained to new electrification projects. Meter replacements and upgrades in other areas should have this capability, but it should not be activated in the short term.

4. Further enhancement of STS 2000

Urgent requests for additional meter capabilities continuously arise. These are easier to entertain if they do not invoke additional hardware because the meter market is highly competitive and very sensitive to meter price. Addition of firmware functionality is thus practical at a rate equal to the evolution in the capability of the meters microprocessor. Known as Moore's Law, this means a doubling of capability every three years. STS capabilities could have thus have expanded eightfold since establishment in 1993. Clearly, the STS technologies have not exploited this opportunity and potential advances have been sacrificed to cost reduction pressures.

The need to respond to the EBSST crisis has caused most manufacturers to divert development resources from meters in order to deal with the upgrading of legacy vending equipment. Meter manufacturers without vending products have however continued to advance their meter designs. Acknowledging the hurdles to introducing an officially promulgated version of STS 2000, and desiring to satisfy market demands, CBI has elected to add enhanced capabilities to their meters consistent with their expectations of the evolution of STS. These capabilities are introduced at no extra cost, in accordance and full compliance with existing STS provisions for such enhancements.

In parallel, these enhancements are offered to the STS working group for inclusion into future STS releases (when such releases are eventually promulgated).

5. STS 2000 draft revision 5.0

The STS Association has recognized the need for, and assisted with, the further development of STS 2000. Contour Systems was contracted to develop the necessary upgrade to the STS Simulator development tool. This new version of the Simulator was completed in August 2001 and is now available free of charge to developers of STS products. Its capabilities extend beyond the documented requirements of rev 5.0

To ease adoption of Revision 5.0, CBI relocated their programmable protection and currency translation features to STS sanctioned manufacturer specific definitions. As common tokens (sub-class 01), these tokens are not meter specific and may be published as public tokens. Table 1 lists some of the Public and Secure tokens provided. Control of sensitive features is achieved via a flag bit-2 timeout mechanism that is activated by a key change process. This ensures that safety features are not changed without proper authorization.

TOKEN PURPOSE	TOKEN NUMBER	TYPE
Set over voltage protection on at 275V	5303 4407 9080 9251 1343	Public
Turn over voltage protection off	1614 0919 7563 2813 0719	Public
Set under voltage protection on at 185V	7148 1150 8806 4627 7875	Public
Turn under voltage protection off	1614 0918 6568 1650 3139	Public
Set earth leakage sensitivity to 30mA	7263 4072 3826 5266 6451	Secured
Set differential leakage tamper detector to 100mA	1729 3840 1631 0107 7811	Secured
Set kWh currency cost to 0.31	7263 4089 9748 5549 0755	Secured

Table 1: Sample Public and Secured tokens – exclusive to CBI meters – vending not required.

One thousand meters were produced and piloted in three sites from March 2001. No problems were encountered. The results were presented to working Group 2 (WG2) and incorporated as STS 2000 draft revision 5.0, and released on 14 May 2001. Fifteen thousand meters with these features have been installed in more than fifty sites during the three months since formal production release on 18 June 2001. Regular contact with the site engineers has been extremely positive with enthusiastic comments about the simplicity of the meters. It is important to note that all sites have followed our advice and have not used the complex tariff capabilities due to the extreme political sensitivity of the Free Basic Electricity crisis.

STS 2000 draft revision 5.0 now caters for step tariffs with five steps instead of the initial three. A Base Rate Token has been added to lend support to time-of-use tariffs and CT or VT ratios. The Tariff Test token has been defined and support for disabling the tamper switch has been reinstated.

6. Factors to be considered prior to promulgation of STS 2000

By now, it should be clear that STS 2000 is a work in progress that is continuing to evolve in response to market dynamics. It demonstrates the healthy interaction of competitive forces reacting to emerging needs for additional capabilities – to the ultimate benefit of the end user. Table 2 illustrates this by summarizing the state of development of the various firmware capability enhancements in the CBI product.

Enhanced STS meter capability	Proposed (WG2)	Defined rev 5.0)	Implemented (v1.4)	Piloted	Released (CBI)
Two-Part Tariffs (hourly credit & credit threshold)	Yes	Yes	Yes	Yes	Yes
Adjustable earth leakage sensitivity (secured token)	Yes	Yes	Yes	Yes	Yes
Currency translation (secured unit cost token)	Yes	Yes	Yes	Yes	Yes

Key change flag bit-2 authorization mechanism	Yes	Yes	Yes	Yes	Yes
Adjustable over voltage protection (public token)	Yes	Yes	Yes	Yes	Yes
Adjustable under voltage protection (public token)	Yes	Yes	Yes	Yes	Yes
Tamper switch disable capability (tamper counter)	Yes	Yes	Yes	Yes	Yes
Energy step tariffs (TI, C and F tokens – five steps)	Yes	Yes			
Power step tariffs (P and F tokens – five steps)	Yes	Yes			
Adjustable tariff base rate (time of use or CT/VT ratios)	Yes	Yes			
Tariff test token sequence (token class 01, sub class 01)	Yes	Yes			
Tariff index lookup tables (regional tariff standards)	Yes				
Feedback token for meter reading and auditing	Yes				
Service control token with power restrictor	Yes				
Standardized warning and trip display messages	Public	FDS	Yes	Yes	Yes
Low cost audit data transfer via consumption LED	Public	FDS			
Enhanced credit reader port definition and protocol	Public	FDS			
Extra safety features (over temp, raised/lost neutral)	Public	FDS			
Energy efficiency and load shedding innovations	Public	FDS			
Basic datalogs for audit and power quality monitoring					
Networked meter support (messaging, alarms & alerts)					
Loss reduction features (bypass detector, expiry timer)					
Customer care and convenience (not disclosed yet)					

Table 2: Development progress of enhanced STS "meter" capabilities

The concept of an electricity "meter" is no longer adequate to describe devices with the above capabilities. Economic pressures have brought about the convergence of metrology and protection technologies so that such devices now have to be considered as "installations"[2]. However, the growing demand for networked devices with comprehensive customer care facilities, is ushering in a new era whereby the traditional "meter" is more accurately described as a "Service Interface Device" (SID). The value of the enhanced meter capabilities presented above is thus best understood from a consumer centric service driven ethic.

Similarly, the crucial need to guarantee conformance, inter-operability and standardization of such SID's reaches far beyond the defined scope of the STS Association. Performance specifications such as the Eskom FDS, based on the original MC171 document, are in urgent need of review and integration into national SABS standards. It is unrealistic to expect the STS Association to be able to direct and regulate the advancement of "non transfer" related aspects of SID standardization. Mechanisms to reach consensus relating to standardization of broader aspects of SID performance need to be contemplated. A forum with this wider mandate would provide valuable assistance to the STS Association in its attempts to define appropriate milestones at which to formalize and introduce versions of the STS 2000 specification.

7. Cautious deployment of Step Tariffs

Designing tariff structures is a complex science bordering on an art form. The ramifications of introducing the EBSST are clear evidence of the multi-dimensional consequences of legislated tariff changes. This does not mean that new tariff structures should not be introduced, but rather that they require extremely careful planning.

The need for domestic step tariffs in South Africa is widely recognized, however the path to their successful deployment has yet to be defined. Promulgation of such tariffs within a couple of years requires that careful planning and preparation should be completed within a year. The restructuring of the EDI further complicates this activity. Certain steps can however be considered.

Firstly, the capabilities of the domestic metering systems present in the field must be quantified. Most billing applications can accommodate step tariffs with conventional meters. However, step tariff support with existing STS pre-payment meters is clumsy when implemented in the vending systems. Support for legacy proprietary pre-payment meters is highly unlikely, thus invoking meter replacements (again). Replacement of meters with newer products is expensive, time consuming, and best achieved via a process of planned obsolescence over a typical period of ten years. If this is done for the sole purpose of introducing step tariffs, then the tariff capabilities of the meters must be carefully defined and maintained for the duration. Secondly, the objectives of the new tariff have to be clearly defined and carefully targeted. Conflicting social and economic requirements must be formulated into stable policies and then legislated. This is also a slow process subject to political manipulation. Thirdly, any attempt to introduce step tariff capabilities must consider the logistics of tariff change implementation. Properly designed tariff structures do not change for many years in stable communities. The price of the electricity may be frequently altered without affecting the tariff structure. However developing communities might need more frequent tariff structure alteration as development needs evolve. Thus factory settings may suffice for stable communities, but field setting of tariff structures should be contemplated for development projects. Application of lookup tables within the meter to link particular tariff structures to STS defined tariff indexes would simplify a tariff change process to a two token key change activity. This needs careful thought and planning if it is to be viable. Regional Electricity Regulators should be consulted.

Unlike South Africa, most SADC countries have always had energy step tariffs, and these have stabilized. A summary of these was presented at Mossel Bay[1] and it was shown how the tariff requirements of SADC countries could be mapped onto the three steps provided in draft Revision 4.0 of STS 2000. Draft Revision 5.0 of STS 2000 has increased the number of steps to five. The capabilities of Revision 5.0 are thus well suited to the needs of the SADC countries.

8. Conclusion

STS 2000 continues to evolve in response to market needs. Implementation and piloting of new features is an ongoing process driven by manufacturers need to differentiate and improve their products. The rate of promulgation of new STS releases is however at the discretion of the STS Users. The STS Association would be well advised to build a healthy membership of Users from the global markets that it intends to serve, to ensure that the full spectrum of requirements is catered for. The Two-part and step tariff capabilities of Revision 5.0 need to be considered by legislators, regulators and tariff design experts as another tool to use in the drive to provide a safe, sustainable and affordable service.

Roland has an MSc (Elec Eng) from the University of Natal and an MDP from UNISA. He has worked for ICDC, SAMES and IST where he designed silicon chips and military video systems. He is a senior member of the SAIEE and an active member of SABS TC62, SARPA and the STS Association. He is chairman of the SA National Committee for IEC TC13. He can be contacted at rolandh@cbi.co.za

[1] R Hill – Pre-payment Poverty and Wealth Tariffs, AMEU conference, Mossel Bay, 2000

[2] R Hill – Pre-payment Installations, Metering Africa conference, Accra, Ghana, 2001

USE AND IMPACT OF ELECTRICITY IN A RURAL VILLAGE IN THE NORTHERN PROVINCE

Author & Presenter: C Thom MSc – Researcher at Energy & Development Research Centre, University of Cape Town (UCT)

Co-author: N Mohlakoana BA Honours - Research intern at Energy & Development Research Centre, UCT

Introduction

This paper presents findings on the use and impact of grid electricity in the rural villages Garagopola and Legabeng (shortened as Garagopola), where a study called 'Case studies on the impact of electrification in rural areas' has been undertaken since 1999.

The study has been supported by Eskom - financial support has been provided by Eskom Research, Development and Demonstration, a department of Eskom's Resources and Strategy Division, and the research has been guided by a working group mainly comprising staff members of Eskom Distribution.

The key issues investigated in the study are:

- Impacts of rural electrification on energy use patterns, the work burden of women, and people's quality of life
- Factors that determine how much electricity is used by rural households
- Changes in household electricity consumption and demand over time
- Problems that rural people experience which hamper their use of electricity
- Extent to which electricity is used for studying by school students
- Use of electricity by small businesses, and problems they experience

From 2002 the study will also look at the impact of the Electricity Basic Services Support Tariff (EBSST) on electricity use, household expenditure, and poverty alleviation, as the EBSST will be piloted in this area.

Description of Garagopola

Garagopola is situated along the main road (R37) between Burgersfort and Pietersburg in the Northern Province, within the Greater Tubatse Local Municipality.

In 1996 the community comprised 353 households and 2500 people, according to information obtained from The Mvula Trust.

The villages fall under the jurisdiction of the Maroga Tribal Authority, which is responsible for land allocation amongst other things. Households generally have large homestead plots, which are used for growing crops.

The villages are located about 20 km from Burgersfort; people in the area therefore have relatively good access to commercial goods and services. The population in the surrounding area is quite large, and several mines in the area employ local people – one of these is located a few kilometres from Garagopola.

As a result of these factors, the lifestyles and values of people in the area reflect a mix of traditional and modern influences.

Electrification of Garagopola

Electricity has been available since 1 May 1997 when the villages were electrified by Eskom. Because of the relatively large plot sizes in the area, a two-phase medium voltage distribution system was used to achieve the installation cost of R3000 per connection.

The following supply options were provided:

- 8A (no connection fee)
- 20A (R65 connection fee)
- 60A (R450 connection fee)

Because of the 8A option offered, all households in the two villages were connected to the grid.

Research approach

The research method used is mainly in-depth qualitative interviews with households, while household surveys are also conducted to capture quantitative information.

The households interviewed are selected from those monitored as part of the Load Research Studies undertaken by Eskom – that is, the electrical current drawn by these households is being recorded on a continuous basis. Households in our sample are selected to represent a range of electricity consumption levels. Information collected on these households is analysed together with measured patterns of electricity demand.

The following aspects are monitored as part of this social research project:

- household characteristics, behaviour and attitudes
- household income and expenditure
- household energy use and use of electric lights and appliances

This is being done over a few years – it is therefore a longitudinal study.

In 1999 multiple interviews were conducted with 19 households to collect in-depth qualitative data. Information collected on the use of lights and appliances was checked against the measured patterns of electricity use.[3]

In May 2001 a survey of 57 households were conducted to collect quantitative information. In August 2001 in-depth interviews were conducted with 29 households to collect qualitative information. This included 17 of the households first interviewed in 1999.

This paper summarises the findings of the 1999 study (Thom et al 2000), and some preliminary findings of the 2001 study, as all the data has not yet been analysed.

Household characteristics

As background to the rest of the discussion, some characteristics of the households surveyed in May 2001 in Garagopola are summarised here.

Household income

The average income of households is about R950 per month. About 61% of the households have an income below R800 per month. This can be compared to the following:

- In 1996 Eskom found that 50% of households in Garagopola-Legabeng earned less than R800 per month
- The 1996 Census found that 72% of households in the Northern Province had an income below R800 per month (Stats SA 2000: 11)

Incomes in Garagopola-Legabeng therefore seem higher than the average for the province.

Electricity consumption

In the period March to May 2001 the average consumption per household in the sample was 108 kWh per month.[3] About 50% of households used 85 kWh or less per month. The majority of households (29%) used 50-100 kWh per month, and about 25% used 0-50 kWh per month.

Gender of household head

The majority of households are headed by men (64%), and the rest (36%) are headed by women. This contrasts with the situation in the province as a whole, where there were 48% male-headed and 52% female-headed households in 1996 (Stats SA 2000).

The majority of households using less than 50 kWh/month are headed by women – this is the poorest group with an average income of about R500 per month.

Appliance ownership

More than 70% of the households surveyed in May 2001 own four or more electrical appliances. Appliance ownership by households is as follows (May 2001):

- 81% own electric radios and/or hi-fi's
- 70% own electric irons
- 70% own electric stoves or hotplates (11% own electric stoves; 59% own hotplates)
- 65% own television (TV) sets
- 65% own electric fridge's/freezers
- 56% own electric kettles

Appliance ownership in Garagopola-Legabeng is higher than national averages. (Davis & Ward 1995). Reasons for this may include:

- National figures are outdated
- Garagopola has been electrified for 4 years
- Many people in the area aspire to a convenient modern lifestyle
- Appliances are accessible from nearby towns
- Women have a significant say in the decisions to acquire appliances
- Household income seems higher than the average for the Northern Province

The 1999 study indicated that, while households using less than 30 kWh per month tend to have few if any appliances, there is no simple relationship between the ownership of appliances and electricity consumption at higher consumption levels. Ownership of television (TV) sets, radio's, hi-fi's, irons and hotplates are common at all consumption levels above about 30 kWh per month. However, kettles, fridge's and freezers seem to be more frequently owned by households with higher consumption levels.
One therefore has to conclude that appliance ownership is not a reliable indicator of household electricity demand.

Use and impact of electricity

Changes in energy use patterns

Evidence was found of the substitution of other energy sources and fuels by electricity, particularly paraffin, candles, car and dry-cell batteries.
Prior to electrification firewood and paraffin were the main fuels used for cooking and water heating. In some households paraffin has been replaced almost entirely by electricity for purposes of cooking and water heating. All these households had used paraffin extensively for cooking and water heating purposes before electrification, while only a few of them had also used firewood on a regular basis.
In many households some tasks previously performed on a woodfire are now being done with electricity (e.g. ironing, fast cooking). However, firewood is not replaced by electricity to a significant degree.
By far the majority of households in the area used candles for lighting before electrification. All households included in the study now use electric lighting, and most of them only use candles during power failures. However, poorer households continue to use candles in unelectrified rooms and when they are unable to afford electricity.
A few households are still using dry-cell batteries to operate radios in spite of having electricity, but generally the use of dry-cell and car batteries has been replaced by electricity.

Electric lighting – providing a 'bright house'

Most households are dependent on electric lighting - they tend to buy new electricity tokens before the units expire, to ensure that they have electric lighting. Even very poor households try to find money to buy electricity for lighting. However, poor households sometimes go without electricity for as long as a week.
The value of electric lighting to newly electrified households has been underestimated in the past. Many households switch on all their lights in the evening, even if the rooms are not being used - it has become part of the culture to have a 'bright house'.
Very poor households often have rooms without electric lighting. This limits the impact of electric lighting on these households. The main reason for this is the cost of extending electric wiring, particularly if a homestead comprises

separate structures, and long extension cords are needed. These households tend to have other priorities for which they use the money that they have available.

Access to more energy services

Since electrification many households are able to use outside lighting at night for the first time. More than 40% of households surveyed in May 2001 said that they leave one or more lights on throughout the night. This is highly valued as people feel it has improved safety in the area.

The use of outside lights is more common at higher consumption levels. For example, no households using less than 20 kWh per month leave lights on at night. This service is therefore not available to the poorest.

Access to refrigeration services has also expanded as a result of electrification. Few households had paraffin or gas refrigerators or freezers before electrification. Now about 35% of all households surveyed have an electric fridge/freezer which is switched on all the time, while 24% have an electric fridge/freezer which is on some of the time. These appliances are highly valued for storing food, as well as foodstuff and drinks for selling from home.

The use of radios and TV sets has also become more common, as discussed below.

Greater access to information

Electrification seems to have improved people's access to the electronic media.

- About 78% of all households surveyed in May 2001 use an electric radio/hi-fi, and most of them use it every day.
- About 46% of the households surveyed use a TV set, and most of them use it every day.

Prior to electrification some people used dry-cell batteries and/or car batteries to power radio's and TV sets. They are now able to use the appliances for longer periods, while many people only obtained these appliances since electrification.

As a result people's access to information has increased. Many people listen to news programmes as well as radio programmes like 'Lehlokwa la tsela' which provide local news.

TV sets are valued (also by women) for the entertainment provided and for relieving boredom.

Domestic work of women

Women generally feel that their work burden has stayed the same in spite of having electricity, even if the nature of the work has sometimes changed. Doing laundry by hand and collecting frewood are the most difficult tasks, and electrification has had little impact on these. Many women don't complain about their work, however, but take pride in it.

Although electrification has not had a major impact on the overall domestic workload of women, the use of electric appliances like hotplates/stoves, kettles and irons has made an impact on domestic work:

- About 44% of all households surveyed in March 2001 use an electric kettle, and about 35% use it every day
- About 44% of households surveyed use an electric stove/hotplate, but only 26% use it every day
- About 61% of households surveyed use an electric iron, and most of them use it at least once per week.

The most significant impact of electricity on the domestic work of women is that it makes domestic tasks easier and reduces the time required. Because of the greater convenience, cleanliness, and speed of electrical appliances (even compared to paraffin), access to electricity reduces the time that women spend on domestic activities such as cooking, water heating and ironing. This involves short 'bits' of time that are saved each time a task is done, rather than a large 'chunk' of time such as the time required for firewood collection, and is therefore hard to quantify. Nevertheless, the overall effect of small bits of time saved throughout the day can be significant.

Electric irons in particular have a widespread impact, as they are used more commonly than electric hotplates/stoves and kettles. Electric irons can also be used by households who use very little electricity. For example, one household using about 20 kWh per month reported using an iron.

The use of electric irons is greatly appreciated for saving time and easing women's domestic work. Before electrification ironing was done with steel presses heated on a woodfire or paraffin stove.

Electric cooking - the unfulfilled promise

The percentage of households who own electric hotplates/stoves in the area is relatively high. This reflects the desire to cook with electricity expressed by the people interviewed. The high ownership of electric hotplates/stoves is partly due to the great influence of women on decisions to purchase appliances. This is the case not only in households headed by women or where women earn money, but also where the husband's earnings form the sole income of the household.

However, the percentage of households using hotplates/stoves is much lower than the percentage that owns these appliances. The reasons for not using hotplates include:

- Broken hotplates are common, and there are problems with the fixing of appliances
- There are concerns about the cost of using electricity for cooking, particularly when preparing foods that require a long time

Quality of life

Some households felt that electricity has contributed to their quality of life in the following ways:
Enhancing their sense of life satisfaction

Improving access to entertainment and relieving boredom

Improving their sense of safety in the area

Energy expenditure

No clear trends were evident in household energy expenditure, with some households spending more on energy since electrification, some spending less, and others spending more or less the same amount (taking price increases into consideration).

Economic opportunities

From the household interviews it is evident that the use of electric fridge's and freezers has increased opportunities for informal home-based selling. However, in most cases the income generated in this manner is very small.
A range of businesses is found in the villages, including shops, metals workshops, barber shops, carpenters, garment makers, shebeens and spaza shops. Many of these utilise electricity, although not all of them do so.
Interviews with some of the manufacturing enterprises indicate that electrification has benefited them:

- A metal workshop was relocated to the area after it was electrified, as the availability of electricity made it viable to operate locally.
- An undergarment business is able to produce higher quality goods because of using electric sewing machines, and is able to produce in greater quantities.

However, in spite of having established a market for their products, these businesses are unable to access credit for purchasing materials. As a result cash flow restrictions limit the size of their operations, and they are unable to increase production to meet the demand for their products.
This illustrates that access to electricity is not sufficient to enable the growth of rural enterprises, as they experience other significant constraints.

Trends in using electricity

Among the households interviewed in 1999 and 2001 different trends in the use of electricity can be observed.
Most of the households have bought more appliances, as they want to use electricity for more purposes. However, this is not always possible due to circumstances - so it does not always mean that they use more electricity.
Some households are using more electricity per month in 2001 compared to 1999, because of new appliances they have bought (particularly fridge's/freezers) and/or because they are using other appliances more often.
Some of the households who are using more electricity in 2001 than in 1999 may not be able to continue doing this, however. Their circumstances have changed during 2001, which have either affected their income already, or probably will in the future.
Some households are using less electricity in 2001 compared to 1999. The reasons for this include the following:

- Broken appliances
- Changes in circumstances that affect income
- Other expenditure priorities (e.g. telephone costs)

Some households have used very little electricity (less than 30 kWh per month) consistently since 1999. These households use electricity for lighting and radios only. While they are all poor, and tend to own very few if any appliances, the reasons for low electricity consumption are more complex – in some cases the households have other priorities, and some of them have broken appliances which they are unable to fix.

Problems people experience

Broken appliances

As mentioned above, broken appliances are very common in the area. The following was found in the May 2001 survey:

- 29% of households with TV sets have broken TV sets only
- 28% of households with hotplates have broken hotplates only
- 20% of households with kettles have broken kettles only
- 11% of households with irons have broken irons only

The incidence of broken appliances is higher than indicated by these figures, as some households have more than one appliance of the same type, at least one of which is working.

People complain about the poor quality of hotplates in particular. They tend to discard broken (small) appliances because of the difficulties they experience when trying to fix them. Some households who can afford it buy new hotplates to replace the broken ones. Some have decided to wait until they can afford an electric stove. Others seem to have given up the desire to cook with electricity.

The fixing of appliances seems problematic for different reasons. People say that they don't know anyone who can fix the appliances, or that the appliances break again after being fixed. Although there are a few people in the area who fix small appliances, they can provide a limited service only because of a lack of equipment and/or training. Their services are also not widely known.

In order to address the problem of broken appliances, the following is needed:

- The standards of appliances such as hotplates need to be improved
- Local people need to be trained and equipped to service and maintain these appliances

Lack of information

There are a number of matters on which there is a lack of information among people in the area. This results in negative perceptions about the costs of electricity, which affect the use of electricity by households.

Many people are unhappy because they are getting fewer electricity units when buying R10 of electricity now compared to a few years ago. They don't understand that this is because the price of electricity increases, and think that they are being 'robbed' by Eskom or the electricity vendors.

People therefore need to be provided with information on increases in the price of electricity, and how this affect the number of units purchased per coupon.

Some people use the highest setting on hotplates because they believe the food is cooked more quickly in this way. People need to know how to minimise electricity consumption by hotplates (and other appliances) without reducing their effectiveness and slowing down tasks unnecessarily.

Views concerning the relative costs of using electricity and paraffin for cooking and water-heating vary considerably with some people feeling that electricity is more expensive than paraffin, and others feeling that paraffin is more expensive. Nevertheless, the view that electricity is the most expensive energy source if used to cook food that require long periods of time seems to be pervasive.

People need to know how much it costs them to use electricity for specific purposes. They often know how much paraffin they use for cooking or water heating, and therefore what the cost is, but they don't know how much electricity is used for these purposes, and therefore cannot compare the costs.

With respect to the last point, there is a need for greater clarity on the relative costs of cooking different foods and meals on electric hotplates and paraffin stoves under the conditions found in rural homes. The quality and condition of the stoves used probably also play a role in this.

Generally people need to be provided with information on the appropriate behaviour that would enable them to get most benefit from their electricity supply. The way in which this information is communicated to people is critical to ensure that its implications are fully understood – interactive and participatory methods would probably be much more effective than traditional top-down approaches.

Electricity supply and services

The main difficulties reported by community members are the long distances they have to travel to electricity vending stations, the regular occurrence of power failures (particularly during summer), and cases of faulty prepayment coupons.

Electricity Basic Services Support Tariff

This section briefly considers the possible effect of the Electricity Basic Services Support Tariff (EBSST) on poor households.

Households using less than 20 kWh per month typically only use electricity for lighting and radios, and don't use lights throughout the night. An example is given here of a household who used between 20 and 30 kWh per month at the time they were interviewed. They used electricity for the following purposes:

- 2 lights for 3 hours each night
- 1 light for 1.5 hours each morning
- Radio for 16 hours per day

Most households using less than 50 kWh per month mainly use electricity for lighting and radios. A few of these households use TV sets, electric irons, kettles or hotplates to a limited degree. In order to illustrate this, an example is given here of a household who used between 40 and 50 kWh per month at the time they were interviewed. They used electricity for the following purposes:

- 4 lights for 3 hours each night
- 4 lights for 1 hour each morning
- TV for 2-4 hours per day
- Electric iron 3 days per week
- Hotplate a few days per month
- Electric kettle about 5 times per month

The only electrical appliances used to a significant degree by this household were therefore a TV and an iron.

The EBSST could have a significant impact on access to lighting by poor households:

- By ensuring access to electric lighting throughout the month
- By enabling households to use electric lighting throughout the night for security purposes

This is important in light of the great value attached to electric lighting.

However, some poor households have only a few lights, and will need assistance to extend electricity to all their rooms if they are to benefit significantly from the free electricity.

Many households have appliances that are under-utilised, and the EBSST would enable them to use these more. However, the benefit to households with few or no appliances will be limited. Poor households will need assistance to make electrical appliances more affordable.

Conclusions and recommendations

This study indicates that many people in rural areas aspire to using electricity for a variety of purposes, but are faced with certain obstacles that need to be addressed. Clearly poverty is an underlying problem which limits the use of electricity, but this cannot be addressed by utilities alone. The following actions could be taken or facilitated by utilities:

- Dissemination of information
- Improving the quality of appliances and availability of repair services

In addition, in order to ensure that the EBSST has the greatest possible impact on very poor households, it will be necessary:

- To assist poor households to extend electric lighting to more rooms
- To assist poor households to acquire basic appliances (e.g. electric irons)

Finally, small enterprises in electrified rural areas need assistance (for example, in the form of credit) to take advantage of the possibilities offered by the availability of electricity.

Acknowledgements

The authors would like to extend their sincere thanks to the following organisations and people who have contributed to this work:

- Eskom Research, Development and Demonstration, a department of Eskom Resources and Strategy, for their financial support to the project
- Minnesh Bipath, Research Operations Manager at Eskom Research, Development and Demonstration, who heads the Distribution Planning Research Portfolio which supports the project
- Other members of Eskom's Distribution Planning Research Steering Committee
- Hendri Geldenhuys, Technology Development Manager at Eskom Distribution Technology, and member of the project working group, who provided extensive comments on this paper
- Marcus Dekenah, consultant to Eskom on the Load Research Studies project, and member of the working group
- Rob Stephen, Eskom Corporate Consultant and member of the project working group
- Vic Lawrence, Project Leader of the Load Research Studies project at Eskom Technology Services International (TSI), and member of the project working group
- Mark Williams, Eskom Strategic Marketing Projects Manager, and member of the project working group

References

Davis M and Ward S. 1995. Household energy-use patterns in rural areas: The effects of access to electricity. Cape Town: Energy & Development Research Centre.

Stats SA. 2000. Measuring poverty in South Africa. Pretoria: Statistics South Africa.

Thom C. 2000. Use of grid electricity by rural households in South Africa. Energy for Sustainable Development, Vol IV, No 4, Dec 2000, pp 36-43.

Thom C, Mohlakoana N, Dekenah M and Heunis S. 2000. Case studies on the impact of electrification in rural areas. Eskom report RES/RR/00/11953. Rosherville: Eskom Resources and Strategy Division.

SKILLS RETENTION AND PERFORMANCE MANAGEMENT – INTERNATIONAL TRENDS

Author and Presenter: Maureen Hovy –
Head of Human Capital, Andersen

Introduction

The presentation and supporting paper intends to outline broad concepts pertaining to the retention of key skills in the global economy and how this challenge may be mitigated by solutions in the area of human capital and reward, such as performance contracting.

The New Economy

The new economy has presented the global market with unprecedented challenges and a demand for more sophisticated talent in terms of global acumen, technological literacy, creativity and entrepreneurialism. These challenges have been even further compounded by the changing needs and desires of the global workforce, who now demand challenging, intellectually stimulating work, exciting career opportunities, lifestyle focused benefits and competitive pay for superior performance. Loyalty to the company is no longer as important as loyalty to one's career. Job mobility is now considered acceptable and desirable, and demonstrates broad and varied exposure in one's field of work. In addition, the employment market of today has been described as a "Global Village" which meets many of the demands of the new workforce. The context of the global market has therefore introduced a unique and complex leadership challenge for South Africa:

Win the War for Talent by attracting and retaining world-class talent with innovative and competitive reward practices and
Optimise and utilise intellectual capital to improve productivity and profitability

In the context of this new economy the employment relationship is viewed from a new perspective. This has necessitated a shift in reward philosophies in order to cater for global business demands while addressing the priorities of the new workforce. What is required is an integrated approach to reward to ensure that the reward philosophy addresses issues pertaining to motivation, development, and retention in addition to financial and non-financial rewards. Winning the war for talent requires a coherent mix of reward components that complement each other and the business strategy.

Performance Contracts

The empowerment of employees in the new economy has facilitated the development of ownership-type behaviour. Employees and employers share the risk and reward associated with the achievement of business objectives. Performance contracts represent the outcome of this process and identify clear individual and group objectives, as well as the consequence for meeting (or not meeting) the performance standards. Guaranteed package increases, short term cash incentive payments, share grants or even career opportunities could form part of this agreement.

Remuneration

Individualised, competency-based, competitive guaranteed practices, competitive cash incentives and significant share grants, in addition to lifestyle focused benefits, are essential to attract world-class talent. Aligning remuneration to company performance measures reinforces a culture of high performance and emphasises the behaviours and objectives that are integral to business (and hence personal) success. This component of the reward package addresses human needs and encourages superior performance, but may have no impact on recognition, motivation, retention, and opportunities for development.

Recognition and Retention

Issues of recognition and retention are addressed by non-financial and intangible rewards that have an effect of adding value to the employment relationship in the eyes of the employee, and function as a return for the investment of human capital. Non-financial rewards can take a variety of forms and should be identified and selected depending upon the nature of the business, industry best practice, culture and other factors. The rewards should be designed to support the company's overall reward philosophy and have significant value for employees. It is therefore essential to understand what motivates people to remain with or leave the organisation. With this understanding, a comprehensive retention strategy may be developed, aimed at increasing employee satisfaction and loyalty, and strengthening productivity in order to secure a competitive advantage in the global economy.

By definition, a Recognition Programme offers a non-cash award in recognition of a high level of performance or accomplishment, often an event which is not linked to pre-determined objectives. It communicates to employees what is valued by the organisation and what is expected of employees, and generates a high degree of commitment. It also acts as a lever for establishing a culture of high performance, whereby achievements beyond the scope of the performance management contract are recognised and rewarded.

Recognition programmes offer a range of awards that may have no equivalent cash value, but have higher memory, perceived or personal value. For the organisation they offer very good value for money, support business strategies and provide for flexibility. From this point of view they are flexible and are a mechanism for reinforcing superior performance or accomplishments at any given time or to any given individual/team. Furthermore, these programmes may be formal or informal, and provide the opportunity for immediate and continuous recognition of success, for example, membership to professional bodies, gifts, desirable assignments, advanced training, opportunities for personal growth, or increased responsibility.

Mentorship Programme

Mentorship programmes are a means of recognition that is managed formally to effect further business results. Mentorship ensures the transfer (and thus retention) of knowledge, skills and expertise between mentor and protégé. In addition to increased productivity, increased motivation and reduced turnover, research stipulates the benefits gained by mentoring/coaching as pronounced initiative and creativity, facilitated managerial succession, enhanced organisation communication and, of course, knowledge retention. A successful mentoring program does, however, require a few essential characteristics. Firstly, it should be integrated with the overall training and development/career-pathing process and will not succeed unless it is viewed as such by the executive team. Secondly, it should form part of the strategic thrust of the organisation. Thirdly, it should be managed in the context of clear role definitions and clarification of accountabilities.

Conclusion

The global shortage of executive, professional and specialist skills compels organisations to optimise individual and business needs through effective performance contracting combined with an innovative balance of guaranteed and incentive cash payments, ownership type long term rewards and focussed non cash retention programmes.

A PERSPECTIVE OF ISO 9000 IMPLEMENTATION AT PRIMARY POWER DISTRIBUTION, TSHWANE ELECTRICITY

AUTHOR & PRESENTER: J.G Lottering PrEng, BEng (Electrical), BCom. Director: Primary Power Distribution.

Introduction

Municipalities are increasingly finding themselves in the unenviable position of having to provide efficient services to a growing sector of the population, while both their budgets and staff complement continue to shrink. To solve this enigma, Primary Power Distribution (PPD) of the City of Tshwane Metropolitan Municipality took the far-reaching decision to adopt the international ISO 9001 certification, which encompasses a holistic management system. The ISO 9001 certification system of the International Standards Organisation recognises excellence in the functioning of an organisation, and encourages continual improvement. Tshwane is the first local authority's electricity utility in Africa to have been awarded this stringent certification.

Management System At Tshwane Electricity

Tshwane electricity realised in 1995 that there was a definite need to implement a Management System. It took Primary Power Distribution almost four years to develop and documented processes covering its key functions namely planning, project management and maintenance of the bulk electricity supply system to meet the requirements of the ISO 9001 standard. This was mainly due to following reasons;

- The changing political environment, which brought about the changing needs of customers asking for new approaches:
- The inclusion of the electrical networks of former "black" municipalities.
- The revision of established ways of carrying out activities that is not valid any more or need to be altered.
- The impact of new technologies in the electrical field, and
- The loss of expertise.

Various management models were evaluated but it was eventually decided that ISO 9000 would serve our needs the best. The reasons will be elaborated on later in the paper.

Description of ISO 9000 Standard

Herewith a short description of the standard and some of the requirements.

General

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees, which include international organizations, governmental and non-governmental. The ISO 9000 family of standards listed below has been developed to assist organizations, of all types and sizes, to implement and operate effective quality management systems.

ISO 9000 describes fundamentals of quality management systems and specifies the terminology for quality management systems.

ISO 9001 specifies requirements for a quality management system where an organization needs to demonstrate its ability to provide products that fulfil customer and applicable regulatory requirements and aims to enhance customer satisfaction.

ISO 9004 provides guidelines that consider both the effectiveness and efficiency of the quality management System

ISO 19011 provides guidance on auditing quality and environmental management systems.

Together they form a coherent set of quality management system standards facilitating mutual understanding in national and international trade.

Quality Management Principles

ISO has identified eight quality management principles which is in line with the Total Quality Management principles (TQM) that can be used by top management in order to lead the Organization towards improved performance.

a) Customer focus
b) Leadership
c) Involvement of people
d) Process approach
e) System approach to management
f) Continual improvement
g) Factual approach to decision making
h) Mutually beneficial supplier relationships

These Quality Management Principals form the basis of the ISO standard.

Quality Management System

ISO 9000:2000 describes a quality management system as follows.

"*The quality management system approach encourages organizations to analyse customer requirements, define the processes that contribute to the achievement of a product which is acceptable to the customer, and keep these processes under control*".

A quality management system can provide the framework for continual improvement to increase the probability of enhancing customer satisfaction and the satisfaction of other interested parties. It provides "*confidence to the organization and its customers that it is able to provide products that consistently fulfil requirements.*"

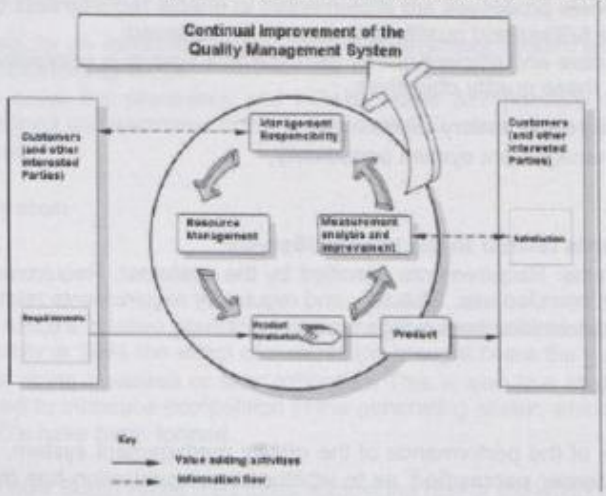


Figure 1 — Model of a process-based quality management system

Figure 1 gives a graphical representation of the quality Management System and indicates how the various requirements relate to each other as well as where customer requirements and satisfaction are addressed.

An organization must indicate that they comply with the following general requirements;

a) Identify the processes needed for the quality management system and their application throughout the organization
b) Determine the sequence and interaction of these processes,
c) Determine criteria and methods needed to ensure that both the operation and control of these processes are effective,
d) Ensure the availability of resources and information necessary to support the operation and monitoring of these processes,
e) Monitor, Measure and Analyse these processes, and
f) Implement actions necessary to achieve planned results and continual improvement of these processes.

Important points

Although all the requirements and points are important, the following need to be highlighted.

Process Approach

A process is any activity, or set of activities that uses resources to transform inputs to outputs. Interrelating and interacting processes needs to be identified to ensure effective product or service performance.
When evaluating processes the following questions need to be ask as it will be tested in the requirements:

- Is the process appropriately identified and defined?
- Are responsibilities assigned?
- Are the procedures implemented and maintained?
- Is the process effective in achieving the required result?

The Role of Top management

Top management is responsible for the effective operation of the quality management system.
They must create an environment where people are fully involved and in which a quality management system ca operate effectively. The role of Top management role can be describe as follows:

a) To establish and maintain the quality policy and quality objectives of the organisation;
b) To promote the quality policy and quality objectives throughout the organization to increase awareness, motivation and involvement;
c) To ensure focus on customer requirements throughout the organization;
d) To ensure that appropriate processes are implemented to enable requirements of customers and other interested parties to be fulfilled and quality objectives to be achieved;
e) To ensure that an effective and efficient quality management system is established, implemented and maintained to achieve these quality objectives;
f) To ensure the availability of necessary resources;
g) To review the quality management system periodically;

Customer-related Issues

Determination of requirements related to the product/Service

The organization shall determine: Requirements specified by the customer, Requirements not stated by the custom but necessary for specified or intended use, Statutory and regulatory requirements related to the product, and
Any additional requirements determined by the organization.

Monitoring and measurement

Customer satisfaction

As one of the measurements of the performance of the quality management system, the organization **shall monit information relating to customer perception** as to whether the organization has met customer requirements. Th methods for obtaining and using this information shall be determined.

Monitoring and measurement of processes

The organization shall apply suitable methods for monitoring and, where applicable, measurement of the **quali management system processes** These methods shall demonstrate the ability of the processes to achieve planne results.

Monitoring and measurement of product

The organization shall monitor and measure the characteristics of the product to verify that product requirements hav been met. This shall be carried out at appropriate stages of the product realization process in accordance with th planned arrangements

Quality Management System at PPD

Implementation Background

Municipal structures are usually not conducive to efficient and cost-effective management and the Purpose Directed Management System used in the (then) Pretoria Electricity was the first step to addressing the shortcomings.

PPD realised that the management system used was vague and uncontrolled. Staff was not sufficiently motivated to use the system to its full potential and the system did, in effect, not adequately take the end user into consideration.

No other management systems studied fulfilled the specific requirements of the electricity utility or satisfied its long-term goals.

When the SABS introduced the ISO 9001 quality management system to PPD, the directorate recognised that this is an internationally accredited system based on Total Quality Management (TQM) principles. It does not focus only on outputs alone but on the activities within a process, which is ideal for service-orientated utility.

After approval from the Pretoria Council to embark on the implementation of the internationally recognised management system, PPD started to write the procedures to implement the ISO 9001 system.

The first mayor task was to adapt the existing management system to a process orientated system, and to start off with the customer in mind. This posed a paradigm shift and to cope with this new mindset, training courses were introduced.

Main Process Development

Primary Power Distribution core focus concerns the planning, construction and maintenance of all the future and existing electrical equipment from the infeed stations to the outgoing 11kV terminals of the 132/11kV substations or the "thick wires". Processes describing these activities were developed as well as processes to determine system performance and resources.

This framework formed the basis for an incremental continuous improvement system where the customer as well as other requirements formed the determining factor.

Procedures were set down to cover the processes and initially, some 327 possible operational procedures were identified, which in time were refined and narrowed down to just over 100, covering the essential processes to run the business and to obtain registration.

Why a Quality Management System

What's in it for Management?

Global Competitiveness

The first answer lies in South Africa's relative standing in terms of the international competitive rating. When South Africa entered the world community in 1994 the effect of competition brought home the stark reality to many companies to radically change their way of doing business or face extinction. This is also true for the electricity sector in South Africa, where government started to introduce competition in the generating sector, which will probably be extended to the distribution sector once RED's have been formed.

To get a clear understanding of how South Africa measures against the rest of the world one ca consider the **World**

Completive Yearbook. This Yearbook analyses competitiveness using 286 valuable statistics for 49 industrialized and emerging economies. The statistics are grouped into four Input Factors: Economic Performance, Government Efficiency, Business Efficiency and Infrastructure.

Herewith a summary of the criteria and where South Africa stands.

Factors	TOTAL Countries	S.A Standing
ECONOMIC PERFORMANCE Domestic Economy. International Trade. Employment. Prices.	*49*	*47*
GOVERNMENT EFFICIENCY Public Finance. Fiscal Policy. Institutional framework. Business Framework. Education.	*48*	*38*
BUSINESS EFFICIENCY Productivity Labour Market Financial Market Impact of Globalisation	*49*	*32*
INFRASTRUCTURE Basic Infrastructure Technological Infrastructure Scientific Infrastructure Health and Environment Value Systems	*47*	*46*

Performance of the Business

Managers need information on how the organisation is performing. Once resources are provided and processes ar defined and measured, management will be in a better position to ensure continual improvement of the product o services delivered.

Customer Requirements and Satisfaction

To monitor the information related to customer perception on whether the service or product has fulfilled custom requirements, will give management an indication on the effectiveness and efficiency of the Management system an how to implement corrective and preventive actions.

International acclaimed Quality Management System

ISO 9000 can be described as the de facto world standard for quality. Over 4000 companies have registered worldwid and most of the concepts can be benchmarked against best practises. For example, by utilising auditors from outsid the organisation one can get an objective opinion with regard to the overall effectiveness of the quality Manageme system.

What's in it for employees

Empowerment

Once processes have been developed, responsibilities, authorities and their interrelation can be assign to employee in order to ensure effective and efficient service delivery. Decision-making is decentralised within the environment the process, which will enhance participated management and will create ownership of the activities to be performed.

Appropriate training and skills development

ISO 9000 requires that whenever work related to the quality of the product or service are affected, training must b provided, continuously evaluated and records must be kept. This is in line with the requirements as set out in the Sou African Qualification Act, where employees with no formal training get acknowledgement for the work they do.

This requirement has a twofold advantage, firstly the employee obtains recognized training and management can claim part of the 1% training levy from Government.

PROFESSIONAL ENGINEERS AS ESI MANAGERS

● MERZ AND McLELLAN

Author & Presenter: Richard A J Frantz, B.Sc Eng (Hons) Pr Eng, CEng, FIEE, SMSAIEE

International Council Representative – Johannesburg, The Insti tution of Electrical Engineers, London (1995 – 2001)

Honorary Member of Council, South African Institute of Electrical Engineers

Member, Executive and Council, British Chamber of Business

1. Introduction

Electricity Supply Industries around the world have undergone great change since the brave British experiment of privatisation of its industry at the beginning of the 1990's.

South Africa has debated and investigated change to its own industry for almost the same period whilst at the same time its society has gone through tremendous change. The industry has now reached the stage where the government is on the threshold of implementing specific proposals for restructuring of the electricity distribution industry on a national scale. At the same time Eskom and government play with models for generation and transmission that reflect popular trends and make the industry more attractive for potential future foreign and empowerment investors. In parallel the changes in municipal boundaries have precipitated a need to amalgamate. It is a time of change, development, growth and uncertainty for the industry.

Traditional electricity supply utilities in South Africa, particularly the municipal electricity departments, were essentially technical operations, reflected in the fact that they were headed by City or Town Electrical Engineers. Administration and indeed political liaison was undertaken by the Town Clerk and financial systems provided and controlled by the Town Treasurer. In earlier times the electricity undertaking was known as the trading department as they made money for the municipality. Profit and cross subsidisation had yet to be made embarrassing political words for municipalities.

The modern buzzwords and concepts for electricity supply industry are "business lines", "commercialisation", "ring fencing" and "transparency".

All of these changes naturally raise the question of who would be best to head up, lead and provide the top management of the new organisations.

The head of a ring fenced commercial business can hardly carry the title 'Electrical Engineer', so should the head even be an electrical engineer even if he carries a business title such as Managing Director or Chief Executive?

This paper set outs the reasons why I believe an engineer, indeed a professionally registered engineer is still a good qualification for the choice of the top business manager, for ESI enterprises that are undergoing radical change, and face developing, growing and uncertain markets.

It is a treatise based on my personal experiences and observations and anecdotal evidence of people and organisations that I have known about, sometimes worked alongside and on rare occasions had the privilege to meet. Having now been asked to present a paper on the topic I have been forced to do some research as to what is management and what is a professional.

It is an exercise which I have found fascinating as the documented information revealed unambiguously the common characteristics of top management and the development of professionals. Coupled with the understanding of the product that an engineer can bring, I am more convinced that my observations and premise are well founded.

The argument that supports my treatise is that top management is all about making decisions, being willing to do so and doing it in conditions of unknown, uncertainty and complexity. They are decisions predicated on assumptions o the future. To do so the manager must know how to deal with and minimise the unknown. But ultimately he mus draw on his intuition to bridge what is unknown, uncertain or too complex to ever properly understand. A hallmark o professional education and training is a development of the skill of research, to break down the unknown and then t be able to make good decisions on your own. To make good intuitive decisions the manager must have a goo understanding of his product. In the context of the electricity supply industry this is electric power, a very comple product, invisible to all our senses.

The common denominators that it all evolves around are growth, new development, unknown, uncertainty, the future intuition, imagination, intuitive, planning, decision-making, responsibility, the product and politics.

My focus is particularly on businesses that are facing change, new development and growth. In as much as I argu and conclude that professional engineers are the best candidates to head ESI businesses in this situation, I can als argue that businesses that are in a state of equilibrium, where the past can predict the future, or even in decline, othe professional disciplines may be as good for heading up and leading the business. Knowing and controlling cost ca be vital for survival so an accountant, the bean counter, may then be best at the helm.

I have also deliberately separated analysis of "the professional" from "the engineer". In terms of this paper I associat "the professional" with the management process, knowing how, how to approach and how to tackle the task. "Th engineer" I associate with "it", "the product" or "the service". He knows how it performs, how it works, and it limitations. But "the engineer" may not have the skill or insight to see the need for the product, commercially develo it and foresee when it will no longer satisfy the market and customers needs.

2. History

We are always told that we never learn from history, so I believe it is useful to look back and see what our predecessors in the industry believed were the qualities that made a top manager of an ESI business.

I am in the fortunate position to do so as in my late father's papers, I found a document produced in 1960 by C Downie, City Electrical Engineer of Cape Town with the delightful title *of "Desirable Qualities of Characte Qualification and Experience for those aspiring to the Post of Assistant City Electrical Engineer".* Appendix 1.

It is interesting to see those criteria that were singled out, given preference and even those undesirable traits th were associated with "good business".

Downie had worked in the era when electricity supply was competing to establish itself against existing if agin technologies and energy sources, the municipalities could not depend on Eskom for supply, in fact in his early caree they dominated Eskom. And it was an era where trust still counted.

But of most interest to my treatise are the listed criteria of
Initiative, imagination, foresight, judgement and capacity for seeing beyond the present. The very attributes identifie as being the skills of planning and decision-making of the successful manager.

a) Academic and professional qualifications. They are set out quite unambiguously.

In those days the duties of the City Electrical Engineer of Cape Town was that of being the Overseas Representative for the IEE, London for the Cape (and the then Rhodesia). There was no registration of professional engineers, eith in SA or the UK.

3. ESI and Politics

Since very early times, the right to produce and supply electric power has been a matter of politics.

The history and writing of Charles Merz, our founder, are littered with the need for Acts of Parliament in the UK i order to be able to generate and supply. I have seen no clear reasons but assume that it was a consequence of th way other society or municipal services were handled and financed, gas, water, sewage, roads. Also supply require servitudes or way leave rights. The services were often funded by rates or local taxes. Tax and land are politic even to this day, and politics is vested personal and group interest.

Charles Merz discovered the importance of politics early in his career as an engineer. He had lead the sponsorship of a bill to the British parliament in 1904/5 that set out to bring order to the chaotic conditions in London. The metropolitan area of London had over 70 distributors, 60 generating stations, each supplying at a different voltage and frequency. Technically the motivation of the bill could not be faulted. The sponsors of the bill were also men of power and influence, yet the Bill failed.

After the failure, Lloyd George, then President of the Board of Trade gave Charles Merz a classic piece of advice. "My dear young friend, this is not a question of engineering, it is a question of politics". (1)

That electric power supply remains a political issue can be better understood in the times we live in. It pervades all developed society, commerce and industry, indeed these are now almost totally dependant on electric power supply. A supply that is also reliable and at low cost. It is also seen as a pillar of improving quality of life and education, second only to effective housing.

It is therefore essential that the managers and leaders in the electricity supply industry are effective in the political arena. Essentially this is communication and lobbying. My treatise will show that this is part of a professional's training and experience. Also that some well known politicians have had an engineering or technology background.

Another aspect of politics that is relevant to this paper is the question of decision making. As Merz found in London, political decisions are not always technically rational. They can be as much wrong as right and are often made with little knowledge or understanding of the future consequences. But then politicians never want to know about problems, only solutions.

The point is that it is not a sin to make a wrong decision, rather that the majority and the important irreversible decisions, are right.

4. The Product

An aspect central to the argument of this treatise is knowledge of the product or service. For the ESI the core product is electric power.

More relevant is that the product is distinguished from others by the fact that our senses are incapable of detecting or experiencing the product. We cannot feel it, hear, smell or taste it. All we are aware of is the effects of the product, it heats, burns, causes movement and light, and shocks. We can only sense and detect it by means of measuring instruments and its properties can only be described by complex mathematics or mathematical models.

The properties in themselves are diverse, the diversity being a manifestation of the complexity. 'It is both power and energy. 'It' is both a commodity (energy) and a service (power). It is characterised by voltage, current, power, and in addition is measured in kilowatt hours (energy "units") kilowatts, mega watts (power), kilovars (reactive, power known as "watt less energy" in earlier years) kilovolt amperes or 'KVA' (a "sort of combination" of power and real and reactive power) all related by 'power factor' not to be compared with 'load factor' or ' load loss factor'. It "alternates", and if we have three phases it "rotates". Under conditions of change and delivery over long distance it is highly unstable. The lowly "electron" hardly features in our vocabulary.

The system 'leaks', the 'leaky' current leaving of the wires and flowing through air (capacitive current) but we can't see the leak, can't collect it in a bucket. It also has the potential to deliver awesome power, (the short circuit) which can cause explosions, burn and violent mechanical movement. To crown it all, the electrical engineers classic defence that his 'product is different", you can't even store it. Indeed the customer never owns it, he just pays to borrow or use it.
When all goes wrong, there is also no other alternative readily available as the people of Auckland learnt 3 years ago.

Small wonder that other than in the small community of electrical engineers, the "product" is not well understood. Even amongst electrical power engineers and technologists, it is my experience that few have an understanding of the more complex characteristics such as transient stability.

What chance does the layman manager who is not an electrical power engineer ever have of understanding the product "electric power"?

5. Management and the Manager

To understand the relationship between the attributes of the professional engineer and management it is necessary t have some understanding of what constitutes management and the good manager.

The dictionary (2) defines 'manage' as amongst dher things "control (household, institution, State)" and, relevant t what we are considering "succeed in one's aim (often with inadequate material, etc.)"

'Manager' is defined as a "Person conducting a business, institution, etc". "Management" even includes som interesting characteristics of "trickery, deceitful contrivance"

There are however as many definitions of management as there are books on the subject.

Modern management teaching (3) identifies a "manager" as "someone whose primary responsibility is to carry out th management process". Which merely passes the task to understanding the "process" without directly answering th question.

The subject is huge and characterised by many different views and ideas. What I am presenting here is far fro complete or definitive, but sufficient to illustrate why professional engineers can make successful managers.

Levels of Management

The kinds of managers by level and area can be classified as shown on Figure 1.

The managers that I am concerned with in this paper are the 'top managers' Typical titles found in this group are Chi Executive, Chief Executive Officer (CEO), Managing Director (MD), Executive Director and in American parlance, President or Vice President ("The VP"). In previous years it would have included the title, General Manager (GM).

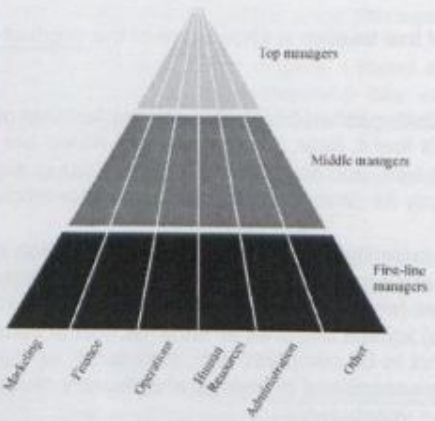


Figure 1

The job of the top manager is complex and varied with a focus largely on future investment and strategies Acquisition, research and development, future market trends, new plants. Generally those activities which carry degree of uncertainty as to their outcome.

Top mangers have often started their careers in the areas of management classified as Operations. Not surprisin as Operations Managers are concerned with creating and managing the systems that produce an organisation products and services.

Management Skills

A classic study of managers identified three important types of managerial skills: technical, interpersonal an conceptual. Diagnostic and analytical skills were later also found to be prerequisites to managerial success.

Technical skills are those necessary to accomplish or understand tasks relevant to the organisation.

Interpersonal skills is the ability to communicate with, understand and motivate both individuals and groups.

Conceptual skills are those that depend on ability to think in the abstract and, in terms of the future, to be imaginative.

Diagnostic and analytical skills enable a manager to visualise the most appropriate response to a situation.

Management Process

The management process can be understood from the viewpoint of systems theory. The basic management activities in terms of this include: -

- planning and decision making
- organising
- leading
- controlling

The activities are interrelated as depicted very simply in Figure 2. This process then combines human, financial, physical and information resources efficiently and effectively for the attainment of the goals of the organisation. Information resources in particular are usable data needed to make effective decisions. Planning and decision making help maintain managerial effectiveness by serving as guides for future activities.

Planning and decision making is the starting point in the management process and the whole premise of my analysis is that if these are not reasonably correct and sound then the other activities on their own will not result in a successful business.

Planning and decision-making are concerned with the future which means a degree of uncertainty and incomplete information and data. The manager must be effective, efficient with an above average success rate to be successful, ensure the business succeeds and is able to grow and meet the challenges of the future.

Decision Making

The hallmark of the duty and activities of the effective manager is decision making, epitomised in the saying "the buck stops here". He must be prepared to make decisions, accept that some decisions will be incorrect, and importantly, made decisions in situations of uncertainty or risk where all the facts or information are not to hand, often will never be to hand.

It is acknowledged that most major decisions in organisations today are made under a state of uncertainty. The conditions under which decisions are made and the chance of making bad decisions are illustrated in Figure 3.

In situations of business or technology development and change, the degree of uncertainty is generally higher. The uncertainty stems form the complexity and dynamism of contemporary organistations and their environments. Uncertainty is the most ambiguous condition for managers and the one most prone to

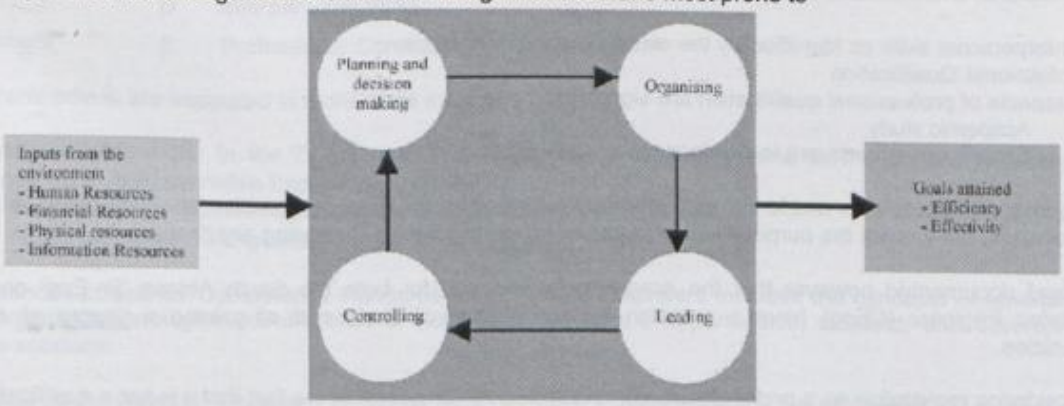


Figure 2

error. Intuition, imagination, judgement, and experience always play major roles in the decision-making proces under conditions of uncertainty.

Intuition which is key in the condition of uncertainty goes beyond logic and rationality. It is an innate belief abo something without conscious consideration. Decisions taken because it 'feels right' or is based on a hunch. This is usually not arbitrary but rather is based on years of experience and practice in making decisions and practic in making decisions in similar situations. (3)

The experience and judgement skill should be deeper and more sound where there is a good knowledge an understanding of the total environment in which the business operates and where it counts most, knowledge of th product, its performance and the customers use and influence thereon.

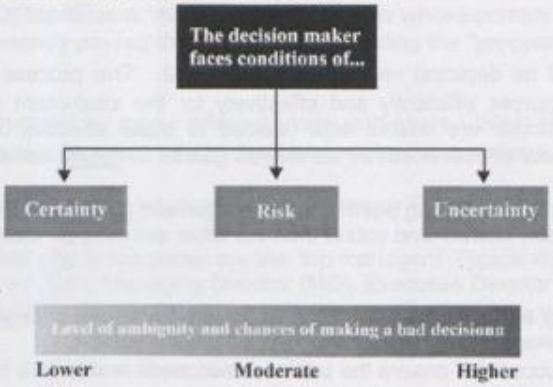


Figure 3

The Outside World and Politics
No business is an island, it interfaces with the environment in which it operates.

The management process as I have briefly described is essentially inward focused on the organisation. However the end the inputs draw from the environment and the goal or output is to deliver to the environment.
It is a recognised role of those in the 'top management' level to represent his/her organisation to the exter environment by meeting with and effectively communicating with government representatives, executives of oth organisations, shareholders, customers, competitors, unions and the press, to name the most significant. (3)

The interpersonal skills as identified by the classic study of managers.
6. Professional Qualification
Two aspects of professional qualification are significant.
1. Academic study
2. Experience subsequent to academic study and training.

The question of acceptable academic study and qualification for professional registration and recognition is controversial, but it is not the purpose of this paper to debate the merits of ongoing arguments.

It is well documented however that the academic qualification for both the South African 'Pr Eng' and the U Chartered Engineer (CEng) have a common base reference of study and of gaining a degree at recognis universities.

In considering registration as a profes sional, sight must also never be lost of the fact that it is not a qualification but a level of guarantee of public safety (in the face of the dangers inherent in engineering products and activities).

Academic Study and the University Degree

At university the student learns and carries out research. It is the research aspect which relates to the qualification of the good manager.

The principles and philosophy of research, as is taught during university induction in the USA, address the following points which best illustrates the relevance of research to the tasks which a successfully manager continually faces. (4).

1. The ability to adjudicate how to search out the truth is perhaps the most marketable skill, once acquired.
2. To make educated decisions about research, 3 questions have to be confronted:

- What is reality (also known as the ontological assumptions we hold)?
- What is our relationship to that reality (the epistemological assumptions we hold)?
- How do we go about discovering that reality (or what methods do we employ in order to know the world)?

Research, like the planning and decision-making process of management is the skill to tackle the unknown, in conditions of uncertainty and arrive at conclusions that reduce the uncertainty and thus enable the future to be addressed with more confidence.

Experience

There are two aspects of the experience of a registered professional:

1. The characteristic and nature of the experience
2. The adjudication of that experience by the professional's peers before registration.

The second point is important as it places a measure of standard or quality on the professional qualification. It can be accepted with a higher degree of confidence by the public at large. However on its own it does not contribute to the ability to be a successful manager.

The Engineering Council of South Africa (ECSA) (5) and the Engineering Council of the UK have had different approaches to the postgraduate period prior to being accepted and being granted the professional qualification. To further cloud the issue the UK Engineering Council is in the process of changing again.
The UK until recently have identified a separate formal training period followed by a period when the candidate must demonstrate that he has been engaged in applying responsible experience in his work (SARTOR 2/99). The new process, defined in SARTOR 3/97 (Standards and Routes to Registration) requires candidates to demonstrate competence and commitment in a range of roles and responsibilities. (6) These are: -

Competence:	A	Knowledge and Understanding
	B	Application to Practice
	C	Leadership / Management / Supervision
	D	Interpersonal Skills
Commitment	E	Professional Conduct

The general criteria are expanded in more detail in Appendix 2.

The common denominator in the ECSA and both Engineering Council Criteria is the concept of Responsible Experience. What is Responsible Experience? (7) (8)

- the exercise of engineering judgement and not merely working to rules.
- responsibility for making decisions, i.e. to do so on your own.

The expanded criteria for Competence standards for Chartered Engineers includes the concepts of emerging, new and advancing technologies, identification of potential projects and opportunities, research and development of possible solutions.

All focused on the uncertain future and the characteristics I have already shown of the successful top manager.

A closing observation on 'experience' in the South African context. Given where South Africa has come from and where it needs to go, much of our society and commercial strategy has identified education and training as paramount. But of concern is the little attention, indeed often absence of reference, to experience. We seem to be out of synchronism with the rest of the world where experience and its associated mentorship are recognised more and more as the necessary attribute of professionalism and the successful business in a rapidly changing technological world.

7. The Engineer

This section is based very much on my personal observations and experience as I have matured in my working life and have had the privilege to mix with many different people, the workers who eventually have to implement an installation through to the executives and politicians, the decision makers of our world.

It is epitomised in a statement I read many years back.
"You can throw away all the management books if the guy at the top is a naturally nice guy and knows his business through and through" (Interview of Dr Colin Gaskell, MD of Marconi Instruments, IEE Review 9/1988).

Because the engineer best understands his product, he is in a better position to make intuitive decisions about its performance, how it can be applied to the customers' benefit, what is needed to make it work and achieve the business objectives. The attribute that "the engineer" brings to the successful manager.

An "engineer" (the noun) is an inventor, contriver, designer or builder of engines or works. But "engineer" (the verb) is to contrive, plan, superintend or manage such activity. Like "manage", "management" and "manager", the word engineer in English again has many meanings and application, noun and verb. But at least for the purpose of this paper there is some commonality in the word, "manage". (11)

Circumstantial Evidence

My thinking in this regard is based on the following observations: -

1. Technology Companies in their formative years, in periods of growth and success, are invariably led by a technologist or engineer who has been educated and trained in the technology of the product.
2. The lead professionals in any major project are invariably those who have the technology training and track record of the basic product of the project.

Classic and well known examples of the first trend. Bill Hewlett and David Packard of the HP company. Bill Gates of Microsoft. Steven Jobs of the Apple (Mcintosh) Co. Steven Jobs's association with Apple illustrates the point very well. When the Apple market had to some extent matured he no longer was comfortable in the business and left. He then went on to form a new company to develop and market a new concept of computer, called NeXT.

Only Hewlett and Packard are engineers, but the examples illustrate my point. Similarly, the big accounting firms were developed and grown by accountants, law firms by lawyers and leading schools stand or fall on the competence of the headmaster or headmistress.

The second trend is more fascinating and certainly was less obvious to me until we worked on the Mossgas project. The product of Mossgas is fuel oils, hence the lead engineering companies, Fluor, Badger, to name but two, are essentially petro-chem engineering companies. Nearer home, the product of power stations is electric power, and although a modern power station is a wonder of mechanical and civil engineering as much as electrical, the lead engineering, design and project company is more often than not an "electrical" firm.

My observation is not limited to engineering, business restructuring is the realm of management consultants, office buildings the architectural firms, water and roads the civil engineer.

The relevance of the lead professional or engineering company has another facet which reinforces my point. If you get it wrong in an engineering project, it doesn't work, the budgets blown or it is not completed anywhere near in time, the failure is hard to hide or fudge and the consequences can be ill afforded by most organisations. If the manager gets it wrong, it is a lot more grey, the poor man or woman can explain it away by the unknown or the uncertainty not going his/her way. For the engineering project it is therefore much more critical that you choose your team correctly. But shouldn't we also apply the same standard to the selection of managers, even though their success or failure is not so obvious.

The Examples

A general and cynical view, often propagated by the ordinary engineer, is that the engineer or technologist does not make for successful managers.

The evidence does not support this. Amongst well known and prominent companies in South Africa we have the following examples.

Anglo American	Leslie Boyd CEng Deputy Chairman, Metallurgist
S A Breweries	E A G MacKay B.Sc Eng (Wits) Group MD
Sasol	Pieter Cox B.Sc Metallurgic and Mining Engineering

MD and CEO

Murray and Roberts	David Bri nk MSc Miningex CEO
BHP Billiton	Brian Gilbertson B.Sc Physics (Rhodes) CEO
Fedics Food	Papi Molotsane B.Sc &
Services	BEngMD
Accenture	Leslie Bergman B.ScEng (UCT)
(Andersen Consulting)	
Altron	Bill Venter CEng Chairman

In 1999, seventeen of the top positions (CEO, MD or Executive Chairman) of FTSE 100 companies on the London Stock Exchange were occupied by engineers, compared with 15 who are accountants. Of the 111 university vice chancellors/principles in the UK, 15 are engineers. This is higher than any other single discipline and represents a significantly higher percentage than the proportion of engineers who graduated in 1998. (9)

More to the point of this paper, at privatisation of the UK ESI in 1991, 13 of the 15 Distribution Companies had CE's who were Chartered Engineers, similarly 2 of the 3 generating companies. The CE of National Grid was also a Chartered Engineer. 10 years later the number of Distribution companies has been reduced to 10 and 7 of the CE's are Chartered Engineers.

(As an aside the average period in office of the CE's in the ESI has been approximately 6 years compared with the average for all companies of 5 years. The inference being that Chartered Engineer CE's do 20% better than others ?)

The Engineer as a Politician

As noted in my introduction, politics is very much part of the ESI around the world. A few well known politicians who were engineers or technologists.

- Benjamin Franklin (1706 – 1790)
- Vladimir Ilyich Ulyanov (Lenin) (1870 – 1924) (12)
- President Herbert Hoover (1874 – 1964) (13)

Benjamin Franklin is remembered as a technologist or scientist for the accurate description of +ve and –ve charge (not just flying a kite in an electric storm). (9)

Lenin was an electrical engineer by education, a fact not well publicised. But the prominence of electrical power projects and supply in communist Russia is sometimes ascribed to Lenin's early background.

President Hoover's name lives on in the Hoover Dam on the Colorado River. Hoover scores twice in my argument. Not only as the politician, the President of the USA, but prior to entering politics he was the Chairman (the manager) of a number of mining companies. He was not known as a great President as it befell his lot that the great depression of the 1930's occurred during his term. But he was known as "the Great Engineer", "the Great Humanitarian" (famine relief) "the Great Secretary" (Department of Commerce) and a "Great Public Servant".

The Bad Manager

I include this section merely to counter the often said statement that engineers do not make good managers. It is a generality which applies equally to all professions and careers. There is even precious little evidence to support the present day faith that the endless columns of MBA's that stream from colleges across the world make good managers (10). And as for management consultants, I will say no more than to remind you of the many humorous jibes about consultants.

It is of interest to understand why good engineers make bad managers as it does give insight into what makes good or successful managers.

The discipline of engineering is to bring certainty to all that man physically makes. When we climb into a lift or elevator in a building, how many doubt, stop to think, that it will not deliver them safely to the floor whose button we have pressed. The engineer is therefore trained to assemble as much information and facts before he makes a commitment or a decision. Time does not come into it, certainty is all important.

But as I have already highlighted, the good manager stands out because he is successful in making decisions, and the right decisions in situations of the unknown, uncertainty, complexity and the future. He is prepared to accept that sometimes he will be wrong. Timeous decisions can be more important than bad decisions.

The Team Leader

Although not central to my argument, team leadership, a mark of the successful manager is also experience that is required to qualify for registration as a professional engineer, both in SA and the UK.

Unlike other professions, engineering endeavour is more often than not a team effort, the team spanning a wide range of skills and abilities. From the intellectual concept developers and planners, to the professional designers down to the assembly workers and labourers. Without any of them the engineering endeavour would not meet its objectives.

Teaming is therefore both natural and essential characteristics of engineering. The same cannot be said for accounting, legal and medical professions, at least to the same extent.

8. Conclusions

My personal experiences, observation and anecdotal evidence had lead me to believe that professional engineers are the best source of top management personnel for the business of the electrical supply industry. Particularly for an industry that is undergoing change, and wishes to grow and develop its core services.

I have examined these observations and evidence and compared them against what is published in the text books of good management.

A vital element of the successful manager, the starting point, is planning and decision making, assessing the future in circumstances of unknown, uncertainty and complexity. Imagination and intuition are an important part of being successful in the decision making process.

A review of what constitutes university academic study (research) and the experience required for professional registration as an engineer (responsible experience) has confirmed that these both equip and confirm the engineers ability in those areas that contribute to successful decision making.

I have also presented evidence that knowledge of the product determines the choices of the leaders in engineering projects and the engineering design and project companies who make them happen. Knowledge of the product, its performance, its market and its limitations are important for intuitive decision making. The product, electric power, is difficult to comprehend and understand, it is invisible to all our senses.

Finally, I have

- identified successful top companies who are headed by engineers
- assembled statistics that internationally engineers do make up at least the same proportion of top executives as other professionals.
- confirmed that the majority of chief executives of ESI business in the UK, where the present trend of privatisation/operation on "business lines" began, are still professional/chartered engineers.

Having undertaken this research, I have confirmed for myself that my observations and the premise from which I started are well founded.

9. Acknowledgements

Dr M G Rodd	Director, Knowledge Services, IEE, London
A F Bainbridge	Deputy Chairman, Management Division, IEE London
A Hadfield	Hadfield Associates, Belbroughton, UK. Previously Chief Executive Northern Ireland Electric and Northern Electric, UK
R A Harker	Past President, SAIEE, Member – Engineering Council of SA. Previously – Executive, Service Delivery, Telkom (SA) Ltd
Dr G S Elder	Assistant Professor, Geography, University of Vermont

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Total Quality: Challenges for Service Providers

Presented By: Sandile Maphumulo
Durban Electricity

Foreword

Quality in a holistic perspective, is a stranger, especially in the service provision environment.

Quality is the word that is used by many very loosely. Few know exactly what the word mean. While the majority cannot define what quality means, have an idea of what to expect from a product or service. It is for this reason that quality means different things to different people, and hence, the saying, quality is in the eyes of the beholder.

Antony Dold of Durban Electricity presented a paper at the AMEU conference in 1998 on Quality of supply and Quality of service from the (NRS 048 and NRS 047 perspective. This paper will not dwell on these aspects, as the writer does not believe in adding salt on the already well salted food. It may render it inedible.

Crosby said Aquality is free. Is this true? Watch the space for an answer to this question under the cost of quality consideration.

Introduction

While Total Quality is the main focus of this paper, it is acknowledged that in order to understand total quality, one must first understand quality.

As a Supreme Court Judge once commented that when pressed to define pornography, he could not define it, but knew it when he saw it. Quality is like that. Although few customers could define quality if asked, all knew it when they see it. This makes a critical point that quality is in the eyes of the beholder.Goetsch, D.L.; David. S. 1994:1). The critical question facing utilities is who are their customers and what is viewed as quality to them.

Definitions

In the old paradigm, managers define quality in terms of meeting specifications (Bounds, Yorks, Adams & Ranney, 1994:29). This definition suggests that quality is assured by weeding out the bad products before they are shipped out to the customers. The new paradigm managers, recognise that product quality is only one component of customer value and seek synergies among quality, costs and schedules, not just just trade offs between them.

Quality can simply and narrowly be defined as meeting specification. This is, however, better than not defining it at all and just relying on the saying that Al know it when I see it.
Quality is consistent conformance to customers= expectations (Pycraft, Singh, and Phihlela, 2000: 613)

Quality is the integrity in delivering what a customer has a legitimate right to expect in view of what was promised at the time of agreement to purchase (Melnyk and Denzler, 1996:103).

Quality is not the same as the product features; quality depends on whether each product feature performs as the firm led the customer to believe that it should (Melnyk and Denzler, 1996:103).

In a broader sense, quality can be defined as a principle that encourages excellence in everything: products, strategies, systems, processes and people.

To inspire a purposeful change for improvement, managers must have a clear understanding of quality. They must understand how it relates to their roles, and how it must be integrated and connected to the organisation's strategy for providing value to customers. This integrated approach brings quality into the mainstream of managerial practices (Bounds et al: 43).

Productivity and Quality

Heizer and Render defined productivity as the ratio of outputs (goods and services) divided by one or more inputs (resources such as labour, capital, or management). Improving productivity means improving efficiency.

Productivity and quality are closely related. Poor quality can adversely affect productivity during the manufacturing or service delivery process. In addition, poor quality of tools and equipment can lead to injuries and defective outputs. Poor utilisation of resources leads to decreased efficiency and therefore decreased level of quality. Conversely, improving and maintaining good quality can have positive effects on productivity. This is achieved by the effective utilisation of resources.

Resource input are referred to as 7 M's, and they are:

- Materials
- Manpower/Labour
- Machines
- Methods
- Measurements
- Maintenance
- Management.

If quality is related to productivity and productivity is the ratio of outputs to inputs, thus meaning effectiveness, quality obviously equals effectiveness. If quality equals effectiveness, it suffices to say that quality costing is a technique to measure effectiveness in terms of rands and cents. How to do this is a challenge to all managers. The eThekwini Electricity case is used to indicate how managers have tried to grapple with this issue and find answers to this golden question.

It is acknowledged that quality costs are difficult to quantify since they are hidden in the present costing system, such as:

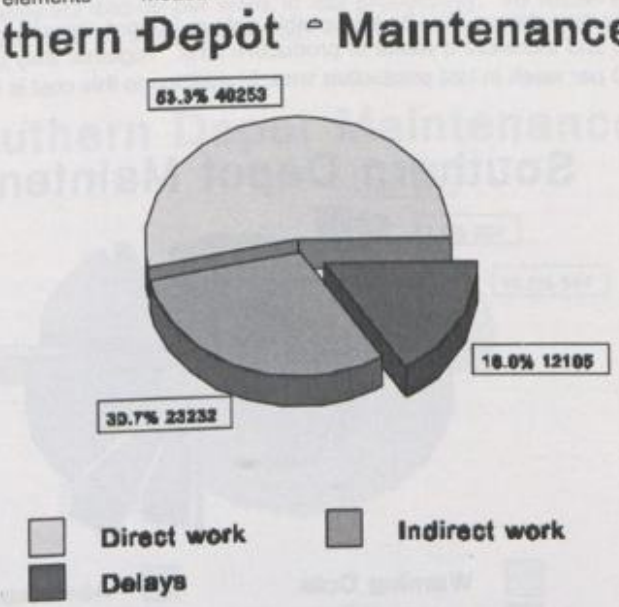
- cost of downtime
- rework/revisit costs
- Idle times and
- waste costs.

Because they are hidden and not categorised separately, they are difficult to control.

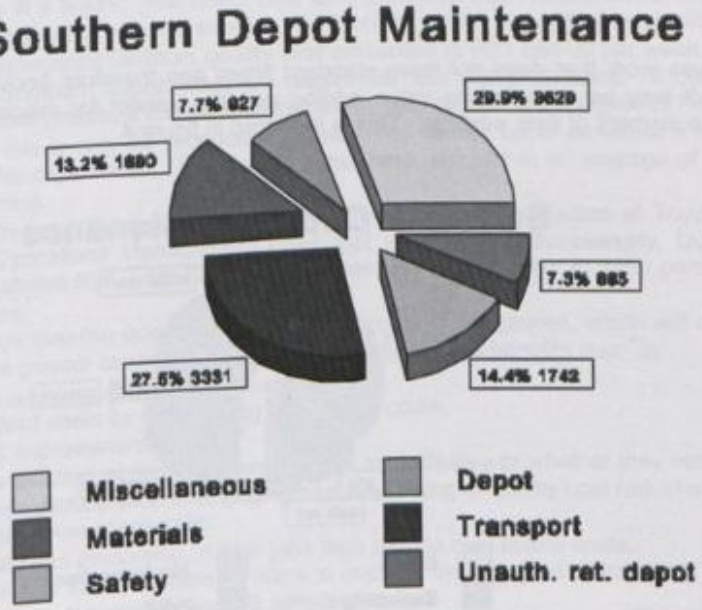
Consciously or not, eThekwini Electricity, in dealing with productivity issues, expose some of the quality problems when evaluating productivity for their incentive bonus scheme.

EThekwini Electricity: Productivity Division define productivity as the ratio between **input** and **output**, which is achieved by the effective use of resources available. These resources are identified as land, materials, plant equipment machines and the services of the workers. To ensure that the workforce, material and plant are effectively utilised, the Productivity monitoring system is used as a monitoring tool. Their document asserts that as management supplies these resources, management must know at all times how these resources are being utilised if the organisation has to succeed.

Figure 1 indicates elements measured to determine the efficiency of each team

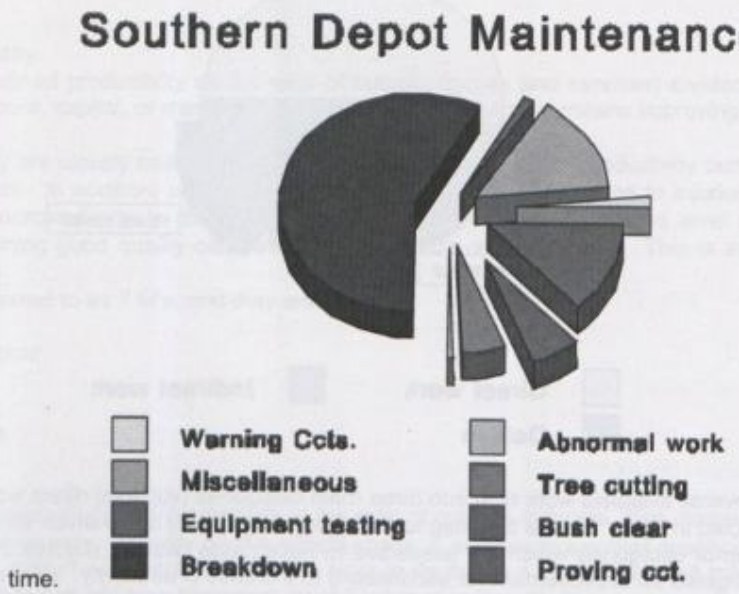


The break down of overall available work time into three main categories (viz: total direct work, total indirect work, and total delays) as depicted in figure 1 is the first step towards exposing quality costs which allow their quantification. A further breaking up of categories which are suspected to have muda (waste), (figures 2 - 5) helps pick up further areas that can be targeted for improvement (or elimination) to increase productivity. Of great necessity is to express these waste elements in rands and cents to demonstrate their exact impact on the bottom line.

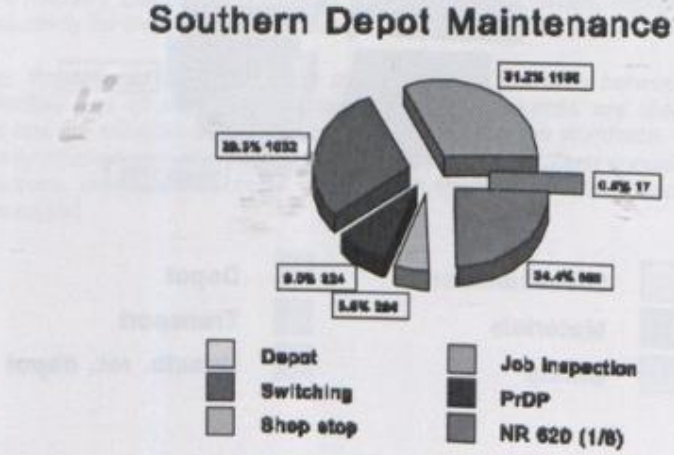


Work teams are expected to have left the depot at 08:00 and return at 16:00. If any team left after 08:00 and retu before 16:00, constitute a delay or ineffective use of time. Some of the delays shown on fig.2 are necessary whi others are just waste of time.

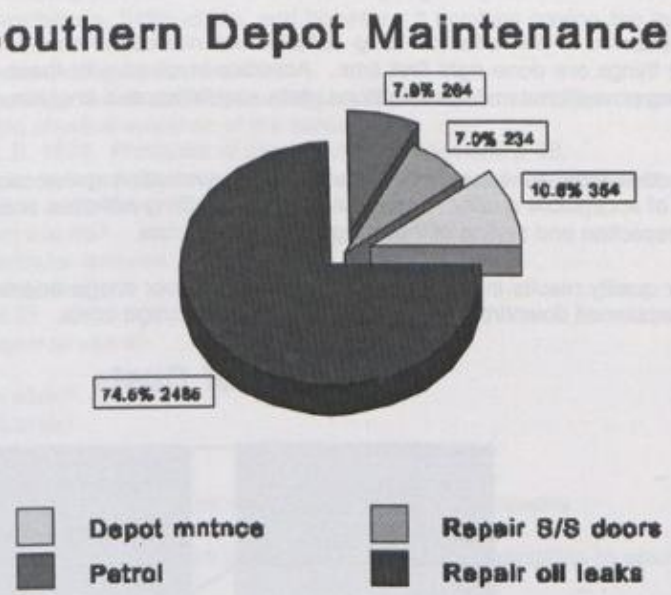
Materials and safety inspection delays may be acceptable delays. Depot, transport, unauthorised return to depot an materials can be avoided and therefore a waste of productive time. Together they constitute 59 hours. This with cos approximately R8 024-00 per week in lost productive time. In addition to this cost is R3 210-00 in vehicle standing time.



Indirect work involves work that does not have standard times and therefore booked off at 100%. All categori indicated in figure 3 may be accepted as value adding activities except for miscellaneous which need a furth breakdown to isolate element of time wastage. This is indicated in figure 4.



Again, here the categories that have an element of wastage is stop shop and nil return (NR). Together this accounted for 18 hours costing approximately R2 448-00 per week in lost productivity. Nil return is considered waste as the team cannot account on what was done on that particular day.



The time taken repairing oil leaks in figure 5 indicates the importance of quality of input materials and equipment in the development of the electricity network. The time invested in repairing cracked mono-block of the GEC T3 ring main units for the week was 41.4 hours. The direct cost for this activity was R5 630-00 for labour and R2 252-00 in transport. Because of the relationship with the supplier, the problem arising out of this was amicably resolved.

In all, for Southern depot Maintenance Division, quality cost amounted to R21 564-00 per week. This analysis was for one of the two divisions in Southern depot. Southern region has four works divisions. If one assume that on the average each division the same picture, it means that the quality cost can be in the region of R86 256-00 per week. It must be borne in mind that this is only for productive teams. The picture could be worse if the analysis was done involving everybody within the department. This figure, annualised, amount to an average of R4 485 312-00. This should tell the reader something.

Reg Kinsman, of Natal Technikon (Business Studies Unit) and Manager: Production at Toyota (Prospecton plant), shared with his Specialist Operations Management class that locally and internationally, Quality Costs surveys of various organisations have shown that Total Quality Costs constitute twenty five to thirty percent of total expenses. Incredible piece of information.

It is based on this knowledge that the quantification of these costs is suggested, which will in turn, give eThekwini Electricity the ability to effect greater control on them and also offering the benefits such as:

- the ability to expose and account for all relevant costs,
- stabilisation of standard costs by maintaining low quality costs,
- easy identification of improvement areas,
- indication of whether existing systems and procedures are effective or whether they need to be changed,
- encouraging employee participation in engaging and supporting of quality cost reduction projects.

This employee participation helps them gain:

- sense of responsibility and ownership of their jobs thus reduce own failure costs,
- the ability to express their ideas concerning ways to improve systems and procedures, or identify bottlenecks,
- management awareness, recognition and job satisfaction and
- the ability to determine and acknowledge their own job performance.

Once the quality costs have been determined, they need to be assigned into the two main categories, namely, cost of control and cost failure to control.

Control Costs
Control costs are measured in two segments.

- Prevention costs and
- Appraisal costs.

Prevention costs are incurred in the effort to keep defects and non-conformance from occurring. These effort attempt to ensure that things are done right first time. Activities involved with these efforts are employee training written manuals detailing procedures and specifications, data acquisition and analysis, and preventative maintenanc among other things.

Appraisal costs on the other hand are incurred through the formal evaluation system aimed at ensuring that the outp product or service are of acceptable quality. Quality inspection, auditing activities ensuring conformance to set rule and procedures, and inspection and testing of incoming supplier materials.

Failure to prevent poor quality results in unsatisfied customers and poor image and money lost on excessive scra unnecessary rework, unplanned downtime and excessive inventory storage costs.

Summary of Costs

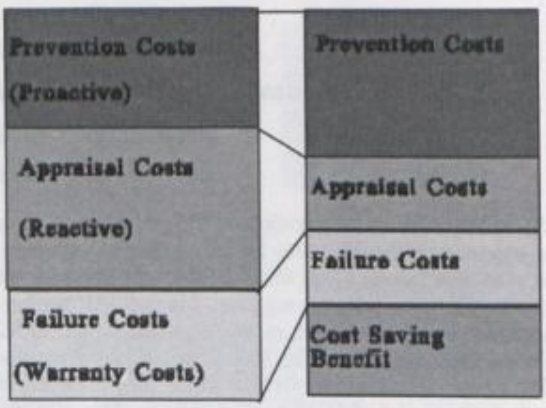


Figure 6

Figure 6 summarises earlier discussions on quality costs. Prevention costs are costs incurred in an effort to avoid t production of defective products or delivery of poor service and therefore pro-active. Appraisal costs are, by the nature reactive. Failure costs are of course, the costs incurred due to defective outputs which can either be detecte internally or detected by the customer.
The message conveyed by figure 6 is that a marginal increase in prevention costs has a magnified effect on the fi quality costs, as significantly less appraisal is required if defects are prevented at source. Again the failure costs w be reduced leading to a definite cost saving which can translate to increased profits for profit oriented organisation.

Determinants of service quality
Customer views on quality are expressed in a number of ways depending on what they require the product and service for. These views for service quality are informed by one or combination of quality dimensions listed below.

- ***Reliability*** involves consistency of performance and dependability. It means the organisation performs th service right the first time.
- ***Responsiveness*** concerns the willingness or readiness of employees to provide service. It involve timeliness of service.

- ***Competence*** - possession of the required skills and knowledge to perform the service.
- ***Access*** - approachability and ease of contact.
- ***Courtesy*** - politeness, respect, consideration, and friendliness of contact personnel (receptionists, telephone operators etc.).
- ***Communication*** - keeping customers informed in a language they can understand and listening to them.
- ***Credibility*** - trustworthiness, believability, and honesty. It involves having the customers= best interest at heart.
- ***Security*** - freedom from danger, risk, or doubt.
- ***Understanding/knowing the customer*** - making an effort to understand the customer=s needs.
- ***Tangibles*** - including physical evidence of the service.

Source: Heizer, J., Render, B. 1999. Principles of Operations Management, p 98.

These dimensions are based on, and determined by the end users who are concerned about the answer to the following question in a product or service:

- Will it do what I want it to do?
- What good is its particular features
- How much does it cost me?
- How soon can I get it?
- How quickly can I learn to use it?
- Is easy to use?
- Does it break down often?
- How expensive is it to fix?

(Bounds et al: p184).

Total Quality Management (TQM)

Defining Total Quality Management (TQM) is as difficult as it was to define quality.

Total quality management can be defined as:

- a comprehensive programme to ensure quality throughout the organisation by placing responsibility for quality at source.
- organisation-wide prevention of injuries and mistakes and an organisation wide system that aims at continual customer satisfaction at continually lower real cost .
- a culture driven process that works horizontally across functions, involves all employees, extends backward and forward to include the internal and external supply chain. It stresses learning and adaptation to continual change to meet or exceed expectations.
- Amanagement of the entire organisation so that it excels in all aspects of products and services important to the customer (Heizer et al, 1999: 82).
- an effective system for integrating the quality development, quality maintenance and quality improvements efforts of the various groups in an organisation so as to enable production and service at the most economical level which allows for full customer satisfaction (Pycraft et al: 732).

One would notice that all definitions of total quality management focus on the customer, either internal or external. They indicate the embodiment and involvement of all in the organisation.

The role of supply chain management in TQM

Better purchasing and supply can make any business competitive. The question is how? Most people are under the myth that lower prices mean lower costs. John Ruskin (1819 - 1900), when comparing value and cost stated that, it is unwise to pay too much, but it is unwise to pay too little. When you pay too little, you sometimes loose everything, because the thing you bought was incapable of doing what you bought it to do. The common law of business balance prohibits paying little and getting a lot. It cannot be done. If you deal with the lowest bidder, it is well to add something for the risk you run. And if you do that, you will have enough to pay for something better. This ties up nicely with the tendering process applicable to most if not all in the local government environment. This by no means suggest that the tendering process is wrong. All it does is highlight the potential damage of appointing the lowest bidder during the adjudication process.

Partnering

The good buyer seller relations facilitates the buyer's effort to gain superior performance, extra service, cooperation on cost reduction programmes, and willingness to share in new processes and procedures.

The nature of the environment within which services utilities work dictates that they work almost in partnership with their suppliers. If one considers the complexity of the maintenance projects that electricity utilities contract out, it becomes abundantly clear that without working in partnership with them, the customers will suffer as the service quality would be compromised. This in a way, suggests a medium to a long term relationship of up to five years. There are a number of reasons for this recommendation.

Arguments for partnering are:

- reduction of quality problems,
- cushioning of bad times through open relationships, and facilitation of learning processes and sharing of technological information brought about by changing market conditions In conclusion, a good supplier makes a direct contribution to a firm's success. They can assist their customers with product development, value analysis, and timely delivery of desired level of quality.

Vendor evaluation and development

In the case of electricity service utilities, the process of finding good vendors does not stop at finding suitable suppliers of physical materials used in developing and maintaining their network, but also extend in many cases to finding suitable contractors to partner with on a limited period contract to perform various functions for the utilities. Because of the nature of the job, these contractors need to be made competed to work on the network and this takes time and other resources. It is for this reason that these contracts should be on a longer term basis. The complexity of the job makes it imperative that these contractors are developed through training and engineering help so that they have an appreciation of quality and service delivery requirements.

The traditional attitude of us and them does not have a place in today's environment.

Just -In-Time and TQM

Action Management Pty Ltd (Study Notes Just-In-Time) claims that from a cost point of view, inventory tends to be between 50 and 85% of cost of goods, whereas labour is only between 3 and 12% depending on the industry. Although this may differ somewhat for services, the cost relationship will be closer.

One way of reducing the cost of inventory is by reducing the amount of stock on hand. This can only be achieved if materials are delivered just before they are needed. The just in time philosophy tends to offer a solution to this inventory problem. JIT is backed by the philosophy of continual improvement and problem solving. When implemented, JIT reduces the amount of inventory that a firm has on hand by establishing quality and purchasing controls that bring the inventory of the firm just in time for use. JIT is not an easy philosophy to achieve as it involves standardisation of processes or proper job scheduling enabling one to identify exactly which materials will be needed at any particular time. This is further complicated by the fact that most materials are sourced or purchased from outside organisations. For JIT to work, there should be a good relationship with suppliers. This is where the benefits of good supply chain management are realised.

Most people would argue that the JIT philos ophy will never work in service industries especially, but there are many areas where JIT can be applied to improve service operations **Standardisation**

Standardisation was said to be one of the crucial elements for the successful implementation of JIT. Bounds has this to say about standardisation:

The term standardisation is not limited to meaning imposed standards such as specifications, protocol, rules and procedures, or conformity of materials, parts, products, machines, etc. While standards are an important part of standardisation, they must be considered in a broader context. Standardisation requires managers to verify operability and performance of new system before releasing them for use, and transmit information about the system's purpose and architecture, educate people who work with the system, and demonstrate that the system works as intended (Bounds et al : p142).

Quality Gurus

Quality as a concept is a brain child of a number of Gurus. A few of them will now be discussed.

Deming's 14 Points for Management

Deming formulated a management theory centred around system improvement, the reduction of variation to meet customer needs, and the humane and intelligent management of people. This brings about the following chain reaction:

- Improved quality
- Cost reduction because of less rework, fewer mistakes, fewer delays, snags: better use of machinery time and materials
- Improved productivity

- Capture market with better quality and lower price.
- Provide jobs and more jobs
- Stay in business.

Deming believed that quality starts with top management and is a strategic activity. In his 14 points for quality management, he emphasised the need for statistical control methods, participation, education, openness, and purposeful improvements. The 14 points are:

1. Create and publish to all employees a statement of the aims and purpose of the company or other organisation. The management must demonstrate constantly their commitment to this statement.
2. Learn the new philosophy, top management and everybody.
3. Understand the purpose of inspection, for improvement of processes and reduction of costs.
4. End the practice of awarding business on the basis of price tag alone.
5. Improve constantly and forever the system of production and service.
6. Institute training
7. Teach and institute leadership
8. Drive out fear. Create trust. Create a climate for innovation.
9. Optimise towards the aims and purposes of the company the efforts of teams, groups, and staff areas.
10. Eliminate slogans and exhortations.
11. a) Eliminate numerical quotas for production. Instead, learn and institute methods for improvement.
    2) Eliminate M.B.O. Instead, learn the capabilities of processes, and how to improve them.
12) Remove barriers that rob people of pride of workmanship.
13) Encourage education and selfimprovement for everyone.
14) Take action to accomplish the transformation.

Juran

Juran,s Trilogy is an approach to cross-functional management, composed of the three managerial processes: planning, control, and improvement.

Quality Planning

This is the process of developing the products or service and processes required to meet customers needs. Steps associated with this process are:

- Establish quality goals
- Identify the customer - those who will be impacted by the effort to meet the goals.
- Determine the customers needs
- Develop product features that responds to customers needs.
- Develop processes that are able to produce those product features
- Establish process controls, and transfer the resulting plans to the operating forces.

Quality Control

The steps involved in this process are:

- Evaluate actual quality performance
- Compare actual performance to quality goals
- Act on the difference/variation.

Quality Improvement

This process provides the means of raising performance to unprecedented levels (breakthrough). The steps involved are:

- Establish the infrastructure needed to secure annual quality improvement.
- Identify specific needs for improvements - the improvement project.
- Establish project team for each project with clear responsibility for bringing the project to successful conclusion.
- Provide the resources, motivation, and training needed by the teams to:
- Diagnose the causes
- Stimulate establishment of remedies
- Establish controls to hold the gains.

(Bound et al: p76-7)

To build quality into the organisation necessitates that people be helped to become kaizen conscious, meaning that they should embrace the spirit of incremental step changes in quality or productivity improvement.

P. B. Crosby

Cosby is best known for his work on the cost of quality. His work led him to believing that quality is free and wrote a book about this fact. The summary of his absolutes to quality management are:

- quality is conformance to requirements
- Prevention not appraisal
- the performance standards must be zero defect
- Measure the price of non-conformance and
- there is no such thing as a quality problem.

He also established, like Deming, 14 quality steps, which can be found in Pycraft et al, 2000: p734.

Acknowledgement

It is acknowledged that to do justice to a topic like this a considerable time a writing space. So this is just a tip of the iceberg. Other issues including, but not limited to quality tools and productivity indicators were left out of this paper. More relevant quality tools and benchmark for electricity utilities are the national regulation standards such as NRS 047 and NRS 048.

Conclusion

In the service industry, time is of the essence. Its effective utilization determines how productive the utility is. It was also concluded that productivity goes hand in hand with quality. The definitions provided for quality and total quality management lead one to the only conclusion that in the face of the ever changing customer demands from service utilities, and more specifically in the context of the pending restructuring of the electricity industry in South Africa, quality will be one of the competitive edges that will distinguish the utilities that will be awarded the licenses and keep them.

Bibliography

- Bounds, G,Yokes L, Adams M, Ranney G,. 1994. **Beyond Total Quality Management: *Towards The Emerging Paradigm***. McGraw-Hill Inc.New York. Pages 815.
- Heizer, J, Render, B. 1999. **Principles of Operations Management. 3rd edition**. London. Prentice Hall.
- Melnyk, S.A., Denzler, D.R. 1996. **Operations Management: A Value Driven Approach.** Chicago. Irwin.
- Pycraft, M., Singh, H., Phihlela, K. 2000. **Operations Management**: *South Africa Edition*. Pearson Education. South Africa.
- Stevenson, W.J. 1996. **Production/Operations Management.** 5th edition. Chicago. Irwin.

Unpublished articles

KWANALOGA : Municipal Executive Leadership Development programme Course Pack - 1819 June 2001.

THE BLOEMFONTEIN ELECTRICITY CALL CENTRE - A SOLUTION FOR POWER TO THE PEOPLE

AN INNOVATIVE AND COST EFFECTIVE APPROACH

B de Jager (Pr Tech) and AJ van der Merwe (Pr Eng) Bloemfontein Electricity, Mangaung Local Municipality

Synopsis

Utilities in South Africa are facing new challenges and opportunities. One of the major challenges is the effective and efficient management of all telephonic queries and power failure complaints with increasing customer numbers,whilst human and financial resources remain unaltered. This paper describes Bloemfontein Electricity solution of decentralized call agents in supplementing the capacity of the existing Call Centre staff. It became possible with the development of own fit to purpose software and the introduction of special communication links.

Background

The control room of Bloemfontein Electricity is a 24-hour call centre responsible for the management of the total electricity network of Mangaung Local Municipality and towns in the Southern Free State. All power outage are directed to the Call Centre for prompt restoration of the outage. The human resources for this task consist of operational technicians, responsible for the control and management of the electrical network and an enquiry officer who is responsible for all telephonic enquiries and the dispatchment of repair personnel.

The call centre creates the opportunity for customers irrespective of the type of complaint, i.e. water, sewerage or treasury, to phone requesting advice or to lodge complaints. An average of 8000 calls or more per month are received by the Call Centre personnel of which more than 50% are not related to power failures, thus keeping the operators busy with redirecting calls to other divisions and sections.

1. Introduction

During power outages this way of operation, however, gave way to numerous unsatisfied customers because of having difficulties to log complaints. The problem obviously increased as the number of affected end users increased. Since power failures occur sporadic with resulting in peaks and valleys of activities, (Figure 1) the solution for the queries service problem does not merely lie in the creation of additional posts to deal with the calls.

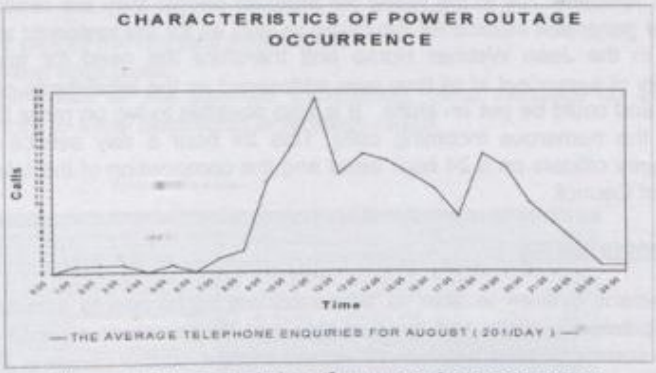


Figure 1. Characteristics of power outage occurrence

To create more posts would have reduced the number of callers queuing during peaks, but resulted in unnecessary additional cost during valleys. Furthermore, due to the pattern of a regular household, the complaints regarding power failures normally increase after hours when most of the users are at home. With the above- mentioned operations procedure it was thus only possible to deal with one or two complaints at a time, while some callers either had to wait in a telephone que queuing system or received an engaged tone.

2. Call Centre Management System

During March 2000 a Call Centre Management System was implemented to address these problems. Only one number was advertised under emergency services in the telephone directory. The Call Centre Management system, being able to accommodate up to 20 calls at a time, would transfer the calls to the first available operator. Additional agents could be logged on to take incoming calls, should it be required during major power failures, but the availability of agents remained problematic.
Several typical features were implemented: These are described in Annexure A.

"Remote" Agents as Public/Private Partners

Although some of the problems were addressed by purchasing the Call Center Management System, the availability of agents after hours was still problematic. During normal working hours, "agents" within Bloemfontein Electricity, for instance administration personnel, could be logged on to assist during a power failure. The difficulty, however, was to cater for after hours. Bloemfontein Electricity identified the need to utilize private individuals to render the service on a 24-hour basis.

3.1 The Handicapped Solution!

Policy of Mangaung Local Municipality dictates the economic empowerment of people with disabilities, and the Council is constantly promoting ways and means for the equatable involvement of such people in economic activities. Bloemfontein Electricity, for example, installed specialized traffic lights for the blind for the Jean Webber Home for the physically handicapped in Bloemfontein. This involvement of Bloemfontein Electricity led to the idea of engaging these people as call operators and the proposal towards their involvement was discussed, resulting in a positive *handicapped solution!*

3.2 Advantages of Using the Jean Webber home

Due to the fact that these residents live in the home for disabled people they are readily available to render such a service. The project further generates income for the home as well as for the residents rendering the service. The Call Center could be placed in the Jean Webber Home and therefore the need for transportation was eliminated. Furthermore the availability of personnel at all time was addressed as the inhabitants of the Jean Weber home were available during all hours and could be put on shifts. It is also possible to log on more than one agent during a major power outage to handle the numerous incoming calls. This 24 hour a day service is more cost effective than employing permanent enquiry officers on a 24 hour basis and the composition of the total complement of operators is in line with the AA Policy of Council.

Communication with remote agents

The Call Center Management System is able to accommodate eight agents simultaneously. Five of them are accommodated at Bloemfontein Electricity and three at the Jean Weber home situated a few kilometers away. This created a problem, as the communication between all agents and the control center at Bloemfontein Electricity should be in time. Furthermore, the status of the power failures should be available to all agents.
Various options to address the distance problem were investigated and three options were tested, namely dedicated communication pilots, Telkom lines and microwave links.

The cable lines were only partly successful as they were not able to accommodate both the voice and data information simultaneously. Microwave links were opted for as the most suitable way of communication; it is able to handle a large number of agents and can thus be extended if needed.
The system adopted is represented in figure 2.

The Bloemfontein Electricity Solution

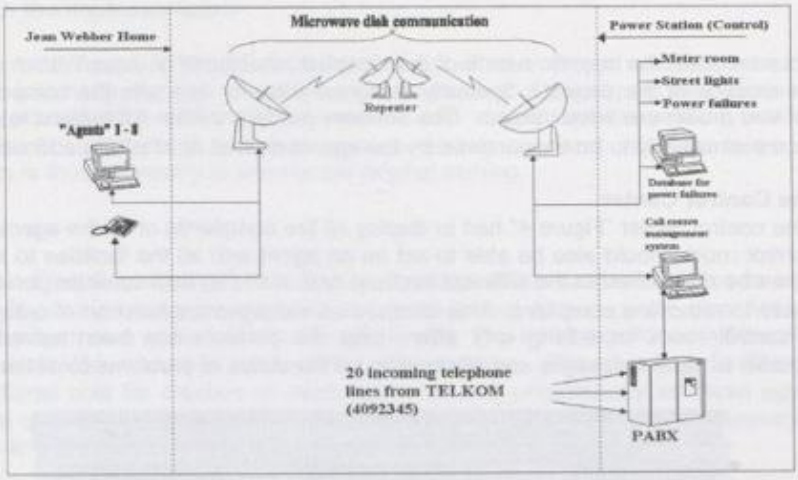


Figure 2. Communication scheme between the Jean Webber Home and Bloemfontein Electricity

Error! Main Document Only.. **Software development**

0.Error! Main Document Only. **Software for Jean Webber agents**

In order to overcome these communication problems Bloemfontein Electricity was compelled to design specific software with front panels to enable the system to communicate from the Jean Weber server through the microwave links to the Bloemfontein Electricity's server and data- base. The designed front panel is divided into three sections namely:

- *Key in the complaint with all the relevant information,*
- S *Make notes on existing area faults*
- S *Key in the complaint with all the relevant information, send message to and from Jean Weber and Bloemfontein Electricity to allow discussion of problem cases.*

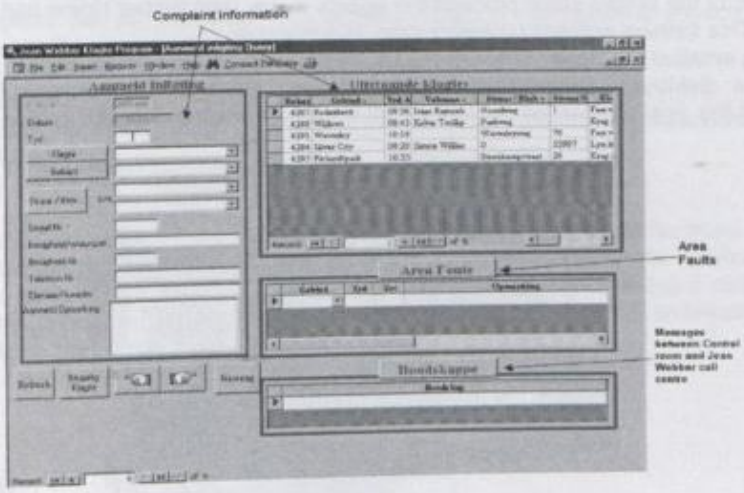


Figure 3. Front Panel for Jean Webber

Requirements to accommodate the specific needs of the disabled inhabitants of Jean Weber were considered in the whole design and execution of the project. Specially designed mice for use with the computers were bought and typing sticks for foot and mouth use were utilized. The software made provision for buttons to display drop-down lists of all the possible complaints likely to be encountered by the agents as well as of all the addresses in Bloemfontein.

5.2 Software for the Control Center

The front panel in the control center "Figure 4" had to display all the complaints of all the agents simultaneously. The personnel in the control room should also be able to act as an agent with all the facilities to log complaints. These complaints should then be dispatched to the different sections and *stand by* field services personnel. No agent on the system should be able to remove a complaint. This central and management function of outages is placed with the technicians in the control room for editing only after after the problem has been solved. The control room technicians are also able to send messages and information on the status of problems to all the agents.

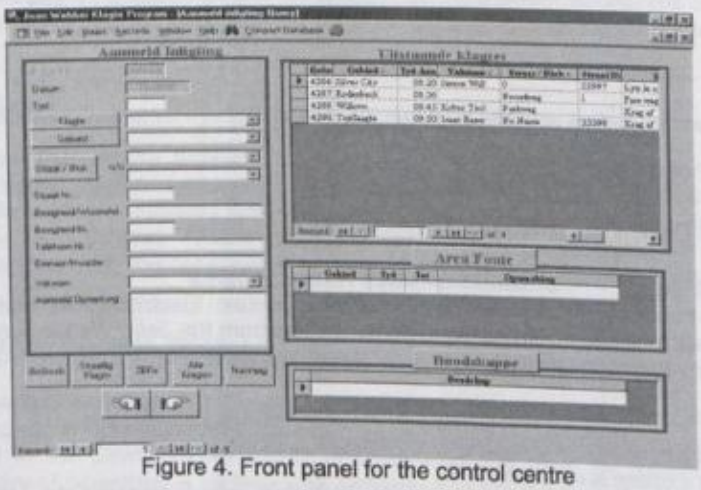


Figure 4. Front panel for the control centre

6. Implementation

6.1 Training

Before implementation of the project could proceed the agents in the Jean Weber Home had to undergo training. This training entailed customer care, telephone et
training. This training entailed customer care, telephone etiquette and basic knowledge on electricity and on the distribution of electricity. The Training Centre of Bloemfontein Electricity presented this specialized training at the Jean Weber Home, at the Call Centre of Bloemfontein Electricity as well as at the Training Centre.

6.2 Problems with the implementation

Some of the inhabitants of the Jean Weber house were never before employed and thus not able to adapt with ease to customer care and telephone etiquette. Furthermore, as a number of them spent their whole adult lives at the Jean Weber Home. The understanding of the city e.g. suburb and streets and the working relation between Service Provider (Bloemfontein Electricity) and customer were completely new and unfamiliar to the agents. Continuous training for the agents is thus necessary to enforce the original training.

7. Conclusion

Although Bloemfontein Electricity experiences a small percentage of consumer resistance for using disabled persons (because of some delay in the taking of complaints due to the nature of the specific disabilities of these agents e.g. typing by mouth) the project as a whole seem to be successful. The advantage for both Bloemfontein Electricity and the inhibitions of the Jean Weber home to outweigh the disadvantages. The advantage for Bloemfontein Electricity is mainly that the additional cost for creation of more posts became unnecessary as these agents are now able to handle the additional queries during peaks. For Jean Weber this opportunity implies a meaningful participation in commercial activities and greater autonomy and self esteem than before.

Annexure A

2.1 Transfer

After the caller made a selection to be transferred to the relevant section, the telephone number of the specific section can be announced to enable future direct calls to the specific section.

2.2 Time / Task scheduler

Specific announcements and tasks can be scheduled to occur at a pre-selected time, eg. during holidays, at lunch times and after hours with pre-programmed messages. On the specified times announcements can be made to inform customers of certain events, for example planned power failures as advertised on certain days and in certain areas, or that the personnel are on lunch.

2.3. Additional agents

Additional agents can be logged on to take incoming calls should it be required during major power failures. The system will automatically transfer a call to the first available agent.

2.4. Agent supervision and performance

The performance of agents can be monitored and problem areas in call handling aspects can be addressed to ensure a more efficient agent.

2.5. Caller data statistics

Caller statistics are available to determine the number of calls, received, transferred, abandoned, response time, call duration and service levels etc.

2.6. Mailbox

This feature enables a caller to still log his/her complaint should all the operators be busy. After a certain time of holding the line, and no operator being available, the caller will be redirected to the mailbox to leave a message. There is, however, also an option to abort holding on after 15 seconds, thus enabling a caller to leave a message. These messages are then forwarded to the mailbox owner automatically, namely the technicians, who are responsible for the handling and dispatching of the messages/complaints.

Bloemfontein Electricity

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The Municipal Systems Act, Integrated Development Planning (IDP) and the Development of Electricity within Local Government

by Deon Louw

CURRICULUM VITAE

Nominee	:	Jacobus Gideon Louw (Deon)
Position	:	Co-Coordinator Electrical Engineering
Company	:	City of Cape Town
Country	:	South Africa

Deon Louw is currently one of the two co-coordinators of the City of Cape Town which entails being the interim manager of Cape Town Electricity on a rotational basis.

Deon graduated at the University of Stellenbosch where he obtained a degree in Electrical Engineering. His career started at the Iron and Steel Corporation where he was a Development Engineer. Thereafter he joined AECI where he was also a Development Engineer. In 1986 he joined the consultant engineers De Villiers & Moore and gained experience in the municipal environment. In 1988 the Municipality of Goodwood decided to take over the electrical distribution from Eskom and he became the Town Electrical Engineer of Goodwood. Local Government was restructured in 1996 and Goodwood was amalgamated into the City of Tygerberg and Deon was promoted into the position of Director Electrical Engineering. Recently all municipalities within the Cape Metropole were amalgamated into the new City of Cape Town. Deon has been Co-coordinator Electricity since March 2001 and is assisting in the restructuring of this new electricity utility.

Deon is the immediate past President of the South African Revenue Protection Association (SARPA). He is a registered professional engineer and is a member of the executive of the AMEU. He is at present chairman of the Training and Publicity Committee and is also the convenor of the joint AMEU/Eskom training committee which is driving an initiative to standardise training between Eskom and the AMEU.

Deon is currently actively taking part in various national electricity restructuring drives which includes the national electrification coordination committee and the restructuring of the electricity distribution industry of South Africa.

1. Executive Summary

This report serves to inform the reader about the Integrated Development Planning (IDP) process that forms the very centre core of the development process of Local Government. The report will indicate that IDP process informs the budget process. It also is the main vehicle through which the municipality must effect the public participation process. The reader is shown the cycle that the IDP has to go through, synchronised with the election cycle of local government. The IDP is absolutely the most important tool and driver of local government as it not only allows the community to have a large say in developments, it also ensures that all services delivered by the municipality as well as other services like telephones are coordinated.

Due to the IDP being the core of the municipality it is also used to prioritise and coordinate the national electrification drive within South Africa. National government intends to have 100% access to electricity within the country by 2010.

The IDP also forms one of the triggers which initiates an assessment process through which the municipality must do introspection to determine the best way it can deliver a particular service. Although the IDP is not the main driver in

this process, the process is of such importance that the report expands on this very important process.

2. Background

During the start of the new form of local government after change of national government in 1994 a new concept in the local government arena was borne. This concept is the so-called Integrated Development Planning. The main theme of this concept was to obtain maximum community input into the decision making process of the municipality and also to ensure that development of services will happen a coordinated approach.

The IDP concept was originally controlled by the Development Facilitation Act, but the control has been switched over to the Municipal Systems Act since chapter 5 of this Act came into operation in July of this year.
The IDP has truly become the pivotal point around which the whole of local government operates. It is the main pillar of the budget and the main interface with the community.

This report will however not deal with the IDP itself alone but will also look at the effect that the IDP has on:

a Electrification Planning
b The assessment process of service delivery.

3. The Integrated Development Planning Process

In order to understand the Integrated Development Planning process it is necessary to look at where it is coming from. The IDP is currently controlled by the Municipal Systems Act, Act 32 of 2000. Chapter 5 of this Act describes and regulates the IDP. This Act derives the objects of the IDP from the Constitution of South Africa which states as follows:

Objects of local government

152. (1) The objects of local government are–

o) to provide democratic and accountable government for local communities;
p) to ensure the provision of services to communities in a sustainable manner;
q) to promote social and economic development;
r) to promote a safe and healthy environment; and
s) to encourage the involvement of communities and community organisations in the matters of local government

152. (2) A municipality must strive, within its financial and administrative capacity, to achieve the objects set out in subsection (1).

Developmental duties of municipalities

153. A municipality must -

a. structure and manage its administration, and budgeting and planning processes to give priority to the basic needs of the community, and to promote the social and economic development of the community; and
b. participate in national and provincial development programmes"

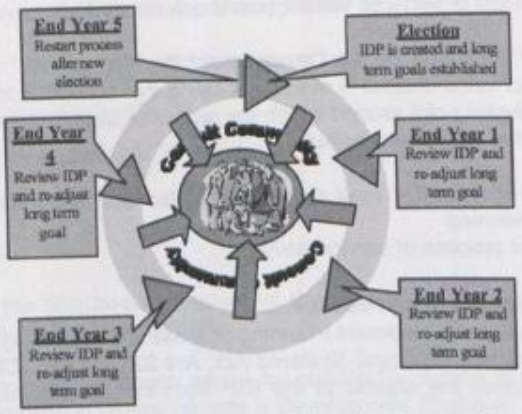
As can be seen the core of the IDP is the involvement of the Community in all development processes of the municipality. Secondly it ensures that services are rendered in an organised coordinated way and hence forms the base of all budgets.

The IDP is not only controlling the development of a single municipality but has to align with that of neighbouring municipalities. To effect this, District Municipalities are tasked to ensure that the IDPs of neighbouring Local Municipalities are in alignment, thereby giving effect to the cooperative governance requirement of the Constitution.

The Provinces are tasked to align IDPs of District Municipalities and Metro's within its boundaries. For this reason the MEC of Local Government is tasked with the approval of all IDPs within that particular province.
The IDP is based on a particular cycle. This cycle starts with the election of a new council. During the first year after the election the IDP is established and workshopped with all role players of which the Community plays the most important part. A long term goal is established for the municipality as well as short term goals with the aim in achieving the long term goal. After the IDP has been drawn up and accepted by all role players, the budget is drawn

up and must reflect the IDP.

During the second to fifth years the IDP is annually reviewed and the long term goal adjusted. Again the budget must always reflect the IDP goals. The whole process is restarted when the new election has taken place. A new Council may however decide to accept the previous Council's IDP.



The Integrated Development Planning Process Cycle

4. The IDP and Electrification

4.1. The Use of the IDP

The IDP is utilised in the process of the national electrification drive. To effect electrification in a coordinated way with other services and to ensure the community involvement the IDP is used. The electrification process makes use of various role players which are all coordinated by the IDP process. These role players are:

4.2. Role players

a. Cabinet
b. Department of Minerals and Energy (DME)
c. National Electricity Regulator as part of DME
d. Department of Provincial and Local Government (DPLG)
e. Local Government (LG)
S Municipalities (Munics)
S Metropolitan Municipalities
S District Municipalities
S Local Municipalities
f. Multi-Jurisdictional Municipal Service District (MMSD)
g. Regional Electricity Regulators (REDs)
h. Provincial Government in the form of the Provincial Departments of Local Government (PG)
i. National Electrification Coordination Committee
j. National Electrification Advisory Board
k. Community

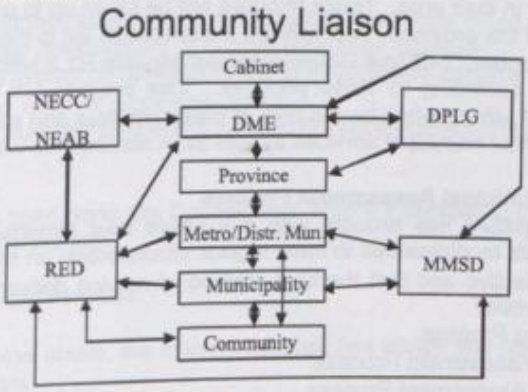
4.3 Functions of the Role players

a. Cabinet
S Approves national sector budgets
S Approves electrification process and time frames
b. DME (including NER)
S Responsible for macro policy/ proced ures/ systems and guidelines
S Administrate budget and monitor overall NEP
S Develop and implement a policy and regulatory framework
S Manage agency contracts

		S	Initiate and integrate planning, implementation, monitoring NEP and payment outputs
c.	DPLG		
		S	Consolidates municipalities' requirements
		S	Negotiates national directives with DME
d.	Municipalities		
		S	Consolidate the IDPs and feed electrification plan proposals into REDs
		S	Give feedback to municipalities. Confirm community need.
		S	Prioritise in line with IDPs based on electrification directive, monitor and evaluate implementation
		S	Address local electrification conflicts.
e.	MMSD		
		S	Responsible for micro policy/ procedures/ systems and guidelines
		S	Administers local government matters with RED
f.	RED		
		S	Receives strategic direction from DME
		S	Develops a provincial electrification program
		S	Negotiates plan with Province, District Municipality and MMSDs
g.	Provincial Government		
		S	Interprets strategic direction and approves provincial electrification program
		S	Conveys mandate to the metro/ district councils
		S	Harmonises IDPs
		S	Decides on provincial prioritisation
h	NECC/NEAB		
		S	Advises the Minister on strategic direction and policy issues related to implementation and performance of stakeholders.
i	Community		
		S	Be informed about electrification directive, plans and projections by REDs or municipalities
		S	Identifies and spells out electrification needs to municipalities and feeds needs to REDs

4.4. Interrelationships of Role players

The figre below shows the interrelationship between role players:



The arrows in the abovementioned figure has the following meaning:

From	To	Communication/Negotiation
DME	NECC	NECC gives advice to DME. DME sets the national annual electrification budget limits.
NECC	RED	NECC advises REDs on electrification policy and standards. REDs initiate and update standards.

DME	RED	DME (NER) approves tariffs, connection fees and connection standards. Accumulates electrification data and sets targets. DME ensures equity within REDs.
MMSD	RED	MMSD governs RED on issues and in terms of powers and functions delegated to it through the Consitution as well as any other functions delegated to it by other spheres of Government. Ensure that all relevant KPA targets are met. Negotiates future maintenance and electrification targets, capabilities and standards. Controls and approves levies on electricity consumption.
RED	Munics	RED obtains IDP information for munics. Munics ensure that all services are developed in a coordinated way as per Munic Systems Act. RED indicates future electrical infrastructure development.
RED	Community	RED conducts electrical business in accordance with policy and standards approved by MMSD and DME. REDs electrify areas as per national, provincial and municipal directives. RED negotiates with community as far as installations are concerned.
MMSD	Munics	Manages REDs on behalf of munics. Introduces levies after they have been set by munics. Coordinates electrification standards and priorities. Ensures that electrification priorities are adhered to.
DME	DPLG	DME provides directives on electrification. DPLG supplies data from IDP database necessary for electrification prioritisation. DPLG together with SALGA negotiates on behalf of LG.
Munics	Community	Municipality conducts community liaison meetings as per Munic Systems Bill and determine LON and LOS. Munics inform Communities of decisions and ensure wide community participation. Negotiate electrification priorities.
DME	MMSD	DME (NER) regulates MMSD/RED electrification contracts and oversees business processes. Ensures that electrification targets are enforece. MMSD coordinates micro regulation of RED with macro regulation of DME(NER).

The abovementioned process has been accepted by national government and as can be seen the core of the process is the IDP. Local Government will control the electrification process in consultation with the community. Together they will prioritise electrification in their area. These priorities will be taken up to provincial level where all priorities will be put into order of priorities of the province. A prioritised electrification list is then submitted to national government who will determine national priorities. National Government will allocate R1.2 billion per annum towards electrification and will allocate these funds according to these priorities. This process will continue until universal access to electricity is achieved. The IDP will therefore be the core of these priorities and will ensure that electrification happens in a coordinated fashion with other municipal services as well as in accordance with the wishes of the community.

5. The IDP and the Municipal Assessment Process

The Municipal Systems Act (MSA) has brought with it a whole new dimension of service delivery within local government. The MSA compels municipalities to have regular introspection on how it delivers services and to ensure that this service delivery is effective and that the best method of service delivery is used. This process essentially goes through three phases namely:

a. Triggering Process
b. Internal Assessment Process
c. External Assessment Process

The Act further indicates in what form municipalities can deliver their service to the community. It divides these methods into two groups: the internal mechanisms and external mechanisms. These are:

a. Internal Mechanisms
i) Department - very little control over support functions such as finance, human resources, information technology and administration.
ii) Business Unit - full control over support functions. Fully responsible for budget.
iii) Another form - probably a hybrid of the above.

b. External Mechanisms
i) Municipal entity - utility company under full municipal control.
ii) Another municipality - in any form but under full control of other municipality
iii) An organ of state - companies such as Eskom
iv) Community-based organisation or non-governmental organisation which is legally competent.
v) Any other person, institute or entity which is legally competent.

5.1 The Triggering Process

Various events are put in place which will trigger a process to establish the best method of delivering a particular service. Each municipality shall assess itself to determine the best way of delivering such service. It may however only do so once certain triggers have initiated such assessments. These triggers are:

a. When a municipality prepares or reviews its IDP
b. When a new municipal service is to be provided
c. When an existing service is to be significantly extended, upgraded or approved
d. When a performance evaluation in terms of Chapter 6 of the MSA requires a service to be upgraded
e. When a municipality is restructured in terms of the Municipal Structures Act
f. When the community so requests through mechanisms as stated in Chapter 4 of the MSA
g. When the provincial executive issues an instruction to this effect in terms of clause 130(1)(a) of the Constitution

5.2 The Internal Assessment Process

This process has now become known as the section 78(1)(a) process. The MSA states that once this process has been triggered the municipality ***must*** first assess the service delivery mechanisms by way of an internal one. This internal process has certainly laid down procedures and steps to be followed. These are:

a. The internal process entails the calculation of the direct and indirect cost and benefits of an internal mechanism. The effect that this mechanism would have on the environment, human health, well-being and safety must also be investigated.
b. The investigation must assess the municipality's capacity and future capacity to furnish the skills, expertise and resources necessary to fulfill the requirements necessary for delivering such a service through an internal mechanism.
c. The investigation must further assess the extent to which resources could be used through reorganisation the administration and the development of human resources' capacity.
d. It must assess the likely impact on development and employment patterns within the municipality.
e. Lastly it must assess the views of organised labour.

The municipality may take into account the developing trend in the sustainable delivering of services in general within the Municipality.

Once the internal assessment has been done, the Council may, before it decides to choose an internal mechanism, decide to investigate an external mechanism.

5.3 The External Assessment Process

As with the internal process above, the external process has similar laid down procedures and steps to be followed. These in turn are:

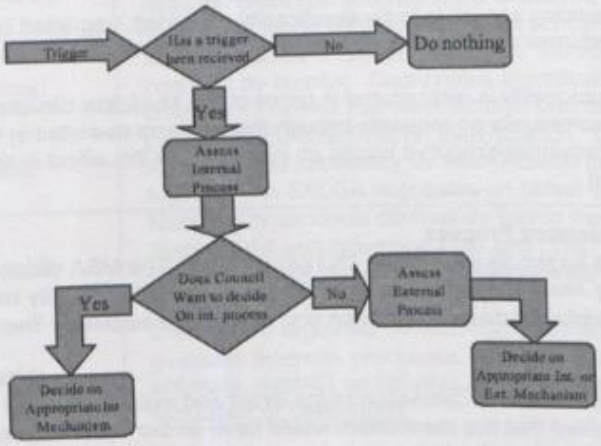
a. With the external process the municipality must inform the community of its intention to investigate an external process.
b. This process, as above also, entails the calculation of the direct and indirect cost and benefits of an internal mechanism. Similarly the effect that this mechanism would have on the environment, human health, well-being and safety must also be investigated.
c. In the external instance it must assess the capacity and potential future capacity of service providers to furnish skills, expertise and resources to facilitate the provision of this service.

d. The views of the community must be obtained in terms of the external delivery of this service.
e. As with internal service it must assess the likely impact on development and employment patterns within the municipality.
f. Lastly too, it must assess the views of organised labour.

Once this investigation has been completed, the Council must look at the various ways of delivering this service and determine what the best method is taking into account all the facets above.

As seen from all of the above all municipalities MUST assess its method of service delivery as all of the municipalities are developing its IDP and have been restructured.

The figre below graphically shows this process:



6. Conclusion

As mentioned above the IDP can be seen as the axis of local government. It coordinates the effective development of services and it requires the total input from the community. Because of this, it is used as the main driver for the prioritisation for electrification. It allows the community to have an important say on where electrification will take place and therefore the coordination of other services as well.

The IDP also acts as a trigger to the performance assessment process of the delivery of services.
The assessment process has been expanded upon to highlight the most important distinctive internal and external processes that municipalities have to follow in order to find the most appropriate way of delivering of a municipal service.

The figure below graphically depicts the importance of the IDP.

WORK MANAGEMENT AN OVERVIEW OF THE APPROACH AND BENEFITS IN A VALUE CHAIN OPERATIONAL BUSINESS

ESKOM

Author & Presenter: Machiel Jacobs, BBA, Nat Higher diploma electrical engineering –

Senior Consultant for Distribution Technology in Eskom Distribution Group

1. Background

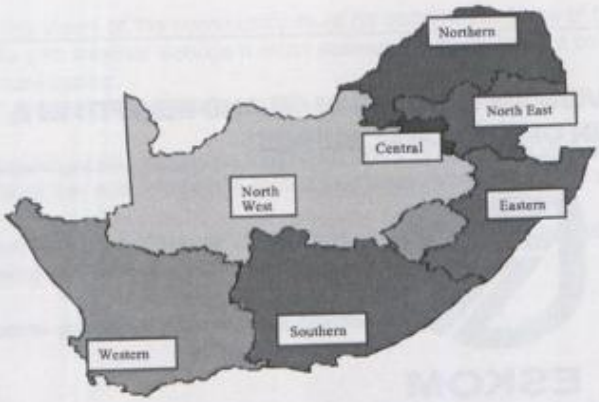
Organisations, Eskom operates in a rapidly changing environment. The need to change, environmental circumstances, innovative technology the dramatic legislation changes all impact the industry. The fight to survive and adopting a satisfactory customer services, change Eskom Distribution focus during the beginning at the nineties from a functional organisation to a process driven business. This was on proving quality and good services. To manage these on-going changes there is a need for accurate and up to-date systems.

It is recognised that failure to give a consistently high maintenance performance has a drastic effect on the productivity and profitability of an organisation. Equipped maintenance department, staffed with tradesmen, is finding itself inadequate for the demands of complex machinery. The levels of expenditure associated with the elementary maintenance work, demanded by the relatively simple machinery of decades ago, are rising, and management is faced with the challenge to reduce these costs.

Eskom is South Africa's national electricity utility, established during the early 1920's, with the business extending in for business groups. Generation, Transmission, Distribution and Eskom Enterprises. The utility dominates the South African electricity supply industry, supplying approximately 95% of the country's electricity requirements. Eskom is a manufacturer, whdesaler, distributor, and retailer of electricity. It also exports the electrical energy to the neighbouring countries such as Mozambique, Botswana, Zimbabwe, and others. The utility sells approximately 41% of electric power to local authorities, which then distribute and reticulate the power to the end-users.

The Eskom Distribution Business is divided into seven regions, which are spread throughout South Africa. The business customer base is about 3.1 million and it consists of residential, commercial, in dustrial, mining customers and also re-distributors.

During the past four years the seven regional Distribution Field and Network Services business units have introduced improved Work Management methods, structures and supporting systems. The Distribution Group has implemented new processes, systems and infrastructure, and also captured and cleaned up massive data in order to improve the performance, and to cope with the increase in customer base. These processes run across the systems and functional boun daries, focus on adding value to the customer and ensure continuous business improvement.



7 x Current Operational divisions

Work Management in the Distribution business

Work Management is the co-ordination of fieldwork that leads to the effective utilisation and application of resources. Work Management consists of business processes, resources, infrastructure and supporting systems. The specific objective of Work Management is to optimally planned work and resources for work to be done.

The investment strategy for Work Management is to re-deploy a significant portion of the savings derivable from processes and systems into the Distribution business. This strategy will consequently limit the scaling down of infrastructure, personnel or transport. Such redeployment would be absorbed into:

- Additional workload due to a growth in customer base
- Take-over of work done by contractors
- Increased preventative maintenance
- Collection of certain asset configuration information

It is also envisaged that certain cash flow savings may realise in materials holding costs and in the safety insurance premium.

Work Management directly supports the overall Distribution objective to provide electricity products and legendary service to customers in the most cost-effective way. Value chains and other information systems provide support for an organisation in achieving this objective.

Maintenance work management entails the effective matching of work demand with available resources, including, personnel, plant, information, tools, transport, infrastructure and spares. This environment is complex which results from ever-changing network, plant condition and customer requirements.

3. Benefits of Work Management

The following describes the benefits to result from Work Management:

- It is anticipated that the correct resources and information to be assembled in a shorter time period, i.e. reducing search time and waiting time. This would result from the improved accuracy, completeness and timeliness of information when maintenance tasks are reported, executed and closed.
- There would be a significant improvement in the timely response to faults. An improvement in customer satisfaction is therefore envisaged.
- There would be an improvement in the effective assignment of resources. This will be due to improved tracking of maintenance teams and their progress on tasks.
- A more effective frequency could be established for preventative maintenance tasks through improved reporting and analysis of faults and equipment status. Deferment or expediting of tasks can thus be optimised. This will result in a reduction in unnecessary work and the rate of breakdowns can be improved.
- Customer service and image is expected to improve
- Every time material is used on work orders a history is kept. This information can be used to refine minimum and maximum stock values accordingly, thus ensuring accurate stock holding.

- Better definition of expenditure to categories like insurance, planned maintenance and customer care, etc. is possible
- The single most useful benefit is the ability to measure and benchmark response to customer complaints.

4. Work Management status in Eskom Distribution

Work Management was identified as one of the processes that could help the Distribution business to manage the change. The change drivers defined for the Distribution business are customer satisfaction, electrification targets, business costs, organisational capability and public safety.

Catering for both Field Services and Maintenance Planning, work management is used on a daily basis by more than 1000 formal users and about 200 informal users in seven Regions on all work management functions for plant, ie maintenance planning, scheduling and dispatching of repair tasks.

Work Management recognises that the workload is increasing and that a specific intervention is required to avoid additional, future costs and to allow the business to cope with this increased workload to maintain the required levels of customer satisfaction and electrification targets.

The Work Management business intent is therefore defined as ensuring the more efficient utilisation of people resources, equipment and available time through optimised work scheduling and resource dispatching for critical, unplanned work within Field Services in Eskom.

The organisational architecture identifes the Field Service building blocks as a centralised Work Management Centre, controlling Field Service Centres, Electricity Delivery Field Service and Technical Specialist Groups.

Business Rules dictate that all Fieldwork will be initiated from the Work Management Centre. Work requests are channelled to the Centre mainly from the Customer Call Centre, the Network Control Centre, the Capital Process and the Field Services execution body. These work requests are processed through various software systems and reach the Work Management Centre mainly via electronic interfaces to ensure the effective and efficient execution of specified work orders within the negotiated time, cost and quality..

Fieldwork can be categorised into two main groups namely dispatching and scheduling work. Dispatching is the function to integrate all unplanned work requiring action. This work requires a reaction of less than 24 hours. In the Dispatching process, performance will be measured according to the conversion time from work equest to work order, the time taken to dispatch a field resource.

Examples of dispatching:

- Emergency repair work
- Emergency switching

Scheduling of work that requires a reaction period greater that 24 hours and feedback of information from Field Services execution. For the Scheduling process, the performance will be measured according to the percentage of available man-hours actually scheduled via the system as well as the percentage of available man-hours actually applied to network related work.

Examples of scheduling:

- Preventative maintenance
- Statutory maintenance and inspections
- Minor build work

As information is essential for both the dispatching and scheduling processes to perform optimally, the accuracy and completeness of all information in the system as well as the timeous capturing of this information is an important performance measure.

Interface concepts:

- Customer relations, programme in order to receive work requests and provide feedback on field work
- Fault Management, the fault management system is for recording events which occur during network operations
- Geographical information system, the purpose is to provide physical location addresses of network equipment.
- Maintenance planning, they are responsible for providing optimal preventative maintenance work package.
- Material Management, to achieve the business benefits of effective dispatching and scheduling, it is a pre-requisite for effective access to the material management system to locate required material.
- Finance, work management interface with the financial system in order to provide details of labour and material transactions taking place in the field.
- Human Resources, to ensure correct date information is available

5. Lessons Learned

During the implementation of work management process the following were encountered:

- Synergy with other systems and interfaces are important
- Unavailability of acquisition, validation and conversion of the information about plant data, personnel, transport, materials, and costing.
- Fundamental supervisor training for operating the systems is a requirement
- The acceptance to limit resistance to change

Acquisition, validation and conversion of:

- Plant data
- Customer information to point of supply
- Personnel information
- Transport information
- Materials information
- GIS and GPS information
- Costing information
- Training to operate the systems.
- Development of job profiles for the effective allocation of maintenance tasks.
- Negotiations to relocate personnel.

Resistance to change and the application of appropriate change management techniques.

- Communication and ensure relevant people are informed.
- The concern is that the roll-out of Work Management requires the people to be appointed and these people will have to be transferred from other Distribution areas, e.g. Field Work Execution. If these people are appointed too early, they will be under utilised and create a bigger burden for Fieldwork Execution.
- Training is a major issue. Training plans need to be clear, who will be the training co-ordinator, who will perform the actual training or what training is required for the different roles.
- IT supports after implementation.
- Development budget. The perception is that too much funds are being allocated to the maintenance application and not enough funds to other applications, i.e. forecasting, providing for other work, etc
- Existing infrastructure needs to be upgraded before the full work management can roll-out. This concern revolves around the volumes on information that needs to be transferred between the different work institutions.

Consideration should be given to split Fault Management from Work Management businesses

METHODS OF EXTENDING THE OPERATIONAL LIFE EXPECTANCY OF AGING HIGH VOLTAGE CABLE NETWORKS

CHARLES VAN DYK - AFRICAN CABLES LIMITED

1.0 SYNOPSIS:

Many of the high voltage gas and fluid-filled cables installed within the South African reticulation network have been in service in excess of 25 years. As these cables come to the end of their expected operational lives their reliability may begin to diminish. Whilst natural aging may occur experience throughout the world has shown that high voltage circuits, if maintained and operated within their design limits, have life expectancies in excess of thirty years.

Utilities responsible for these networks therefore find themselves in a difficult situation when one considers diminishing reliability, a reduction in skilled personnel and the difficulty of raising capital to replace these cable systems.

Three basic alternative methods of ensuring quality of supply, with regard to cable circuits, are open to utilities:

1) Gradual replacement of the aging systems by cross linked polyethylene (XLPE) cable and associated accessories.
2) Refurbishment of the existing cable systems in an effort to extend the operational life of the system.
3) Implementation of a planned preventative maintenance scheme on existing cable systems in order to maximise the system life expectancy.

Due to the costs associated with total replacement of the circuit it has become attractive for utilities to look closely at either refurbishment or planned preventative maintenance. This paper covers issues relating to these options when considering increasing the life expectancy of aging cable circuits.

2.0 BACKGROUND:

Most of the older high voltage cables in South Africa comprise of a paper insulated conductor surrounded by a high pressure dielectric medium of either fluid or gas. The conductors were laid up and enclosed in either a lead or aluminium covering and finished with a PVC or polyethylene outer covering. Figure 1 shows a typical 132kV 3 core fluid-filled cable.

Figure 1: 132kV, 3 core fluid-filled cable

Low pressure self contained fluid filled cable systems have been in use since the mid 1920's overseas and were introduced into South Africa in the early 1950's. These cables provide a reliable and long life solution for the underground transmission of power, when properly maintained.

Major overseas cable manufactures supplied, installed and commissioned fluid-filled cable systems within the South African utility market. These high voltage cables and accessories were supplied and installed by factory trained staff who were fully equipped with the specialised skills necessary to install and maintain the fluid-filled cable systems. A majority of the specialised skills were then retained in South Africa in order to provide back-up service for the cable installations. However, many of the trained staff have either retired or have emigrated from South Africa thereby depleting the industry of specialised skills.

Due to the void created by the loss of these personnel there is great concern within the industry with regard to maintaining these fluid-filled cable systems to allow them to operate for the full duration of their projected lives. Unfortunately in many cases, due to financial constraints and the lack of basic skills, maintenance has been overlooked. In the long term this can prove to be very costly due to a major failure when compared to the cost of implementing planned preventative maintenance on all high voltage cable systems.

Currently, as shown in Table 1, there are approximately 997 circuit kilometres of fluid-filled cable installed and operational within South Africa. The cost of replacing these underground cable circuits with XLPE insulated cable is estimated to be in excess of R1.1billion. In addition, approximately 65 route kilometres of gas insulated cable is also still in operation locally.

Item	Description	Circuit length (km)	Cable length (km)	Quantity of accessories
1	132kV fluid-filled cable	222	355	710
2	88kV fluid-filled cable	85	130	260
3	66kV fluid-filled cable	269	341	682
4	44kV fluid-filled cable	48	48	96
5	33kV fluid-filled cable	373	373	748
TOTAL FLUID-FILLED CABLE		997	1 247	2 496

Table 1: Summary of various voltages and circuit kilometers currently in operation

3.0 BACKGROUND ON THE OPERATION OF FLUID-FILLED CABLE SYSTEMS:

Figure 2 shows a typical fluid-filled hydraulic cable system design including joints, terminations and all auxiliary equipment.

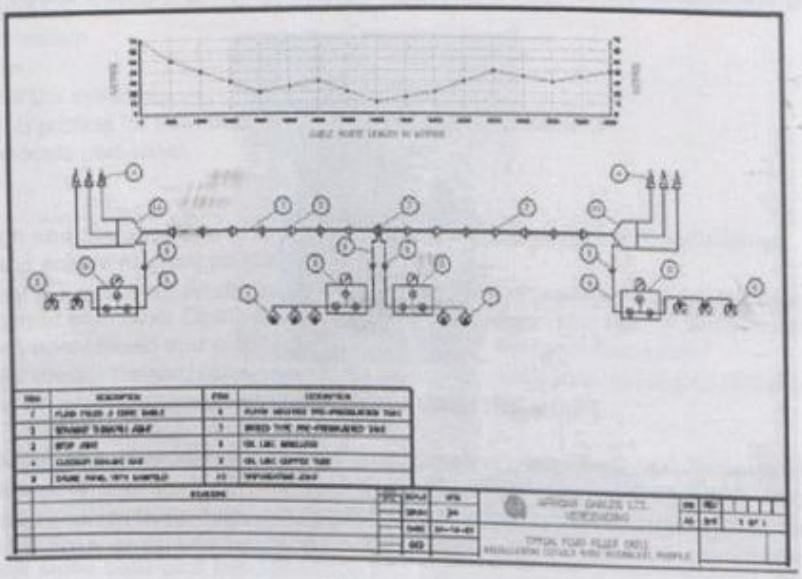


Figure 2: Typical fluid-filled cable system design

On average these cable are installed at a depth of approximately 1.2m below ground level and depending on the route profile, various types of jointing accessories and auxiliary equipment are strategically placed to enable the system to perform to its maximum design criteria.

The cable system is constantly at a positive pressure. Under load conditions a rise in temperature causes the fluid in the cable (insulating oil) to expand and to flow into tanks. The tanks are positioned at either end of the circuit and, if required, at dedicated buried positions along the cable route. The ingress of fluid during expansion is accommodated by bellow type elements within the pressure tanks. The resultant increase in pressure within the element is then available to force fluid back into the cable as soon as the cable temperature falls.

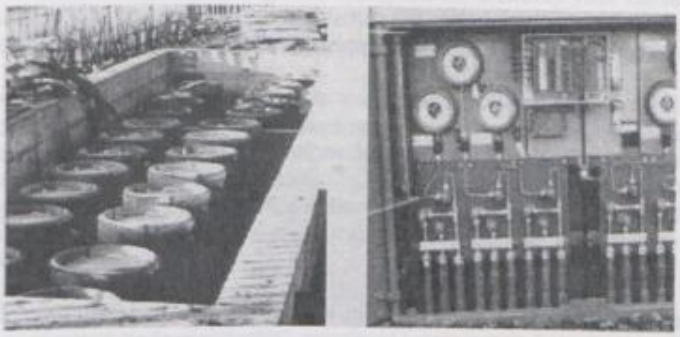


Figure 3: Buried fluid feed tanks along the cable route with auxiliary equipment

It is clear from the above that a fluid filled cable circuit contains far more equipment over and above the cable itself. For this reason it is imperative that maintenance of the system, in its entirety, is performed in order to achieve the required life expectancy from the cable circuit.

4.0 REFURBISHMENT CONTRACTS:

In some cases, utilities have instituted refurbishment contracts on aging gas and fluid-filled cables. This type of contract includes exposing all joints and redoing the plumbed wipes, which are potential leak areas within fluid-filled cable systems. Work is done in off peak periods with no power outages to customers.

This type of work is useful in repairing and refurbishing areas of the cable system which pose the highest incidence of cable leaks. Although this is an effective means of repairing such areas it does not, however, include any of the tests associated with a planned preventative maintenance scheme.

5.0 PLANNED PREVENTATIVE MAINTENANCE;

In order to implement a planned preventative maintenance scheme a utility must complete a basic evaluation of the relevant cable circuit. Cable data for the desired planned preventative maintenance cable circuit should be obtained and, once gathered, this information together with recommended maintenance instructions, obtained from the cable manufacturer, will place the utility in a position to embark on a planned preventative maintenance scheme.

The planned preventative maintenance scheme should include basic tests such as the following:

5.1 Sheath integrity test:

This tests check the integrity of the outer serving. If damaged, subsequent corrosion of the metallic sheath could lead to gas or oil leaks and ultimately breakdown of the cable.

5.2 Hydraulic impregnation test:

A sample of oil, when subjected to the impregnation test and analyzed, gives valuable information as to the quality of the insulating oil of the cable. This information when gathered over a number of years can be used to assess the possible rate of degradation of the cable insulation. This is especially valuable when assessing the requirement to replace the cable system.

5.3 Flow test:

The flow test reveals any blockages within the hydraulic system which might hinder the flow of the fluid to and from the pressure tanks.

5.4 Pressure monitoring equipment:
Pressure gauges, pressure switches, valves and manifolds are inspected and tested to confirm their reliability.

5.5 Earthing checks:
It is necessary to ensure that earthing systems have not been corroded or been stolen. The integrity of all earthing equipment is checked. Missing earth bonding leads or faulty Sheath Voltage Limitors (SVLs), place unnecessary strain on the cable system.

The above tests assist in ensuring that cable systems approach their required life expectancy, thereby delaying any capital expenditure.

Planned preventative contracts have been implemented between local expertise, resident in the private sector, and some utilities. It has been African Cables' recommendation that, in the event of the planned preventative maintenance contract being instituted by the utility, annual tests be conducted on aged cable circuits. These tests, performed by qualified personnel, have shown to give valuable information to the utility as to the integrity of their fluid and gas filled cable.

6.0 CONCLUSION:
Due to the design of critical high voltage cable links, regular maintenance needs to be performed to ensure that these systems operate within their designed parameters. However, limited operating budgets and a loss of grassroots skills and experience has led to many high voltage circuits not being fully maintained.

Planned preventative maintenance, if implemented and performed annually on existing fluid-filled or polymeric cables, will enable utilities to assess the condition of their cable networks constantly. Defects will be highlighted in advance and timeous solutions to these problems will allow utilities to take relevant action before unnecessary power outages occur.

9.0 REFERENCES:
1. BICC Cables Limited, "Fluid-filled Cables Handbook", First edition, 1998.
2. Bungay, E.W.G. and McAllister, D. "Electrical Cables Handbook". Oxford: BSP Professional Books
3. Dickson, A.E. "Alternative Technologies for the Effective Operation of Aging High Voltage Cable", Africa Power, 1999.

ENHANCEMENT OF INSULATION IN MEDIUM VOLTAGE SWITCHGEAR

Presented By: Fernando Bolota
ALSTOM South Africa

• ABSTRACT

With the refinement of instruments in the field of ultrasonic and thermal scanning over the last couple of years, substantial progress has been made in the fields of maintenance, specifically in predictive maintenance of insulation on medium voltage networks.

With regards to medium voltage equipment from a position of intricacy, these instruments have become more user friendly and can be used by technicians during very simple routine procedures with significant capabilities and effective results. We have been involved in numerous investigations and found this advanced technology to be reliable and advantageous to the end users, allowing early detection and avoiding major equipment failures and possible injuries and losses of life.

It is therefore the intention of this paper to discuss and share our experiences with fellow engineers and users in order to gain the upper hand on the integrity of the electrical systems and more specifically on medium voltage switchgear.

• INTRODUCTION

Due to the static nature of electrical switchgear it presents the electrical fraternity and maintenance engineers in particular with a disadvantage because unlike rotating machinery it does not appear to require any maintenance or regular inspection. Medium voltage switchgear when properly commissioned and regularly maintained in accordance with the original manufacturers instructions, is trouble free and proof of this is the large number of installations still functioning perfectly after forty years when only originally designed for a twenty year life span. Investigations carried out in the last decade indicate that the majority of the failures were caused by either human error or inadequate maintenance. In many instances minimal periodical maintenance would have resulted in far greater reliability.

It is important that medium voltage switchgear and its associated components are well maintained and remain functional in order to reduce failures and accidents, which not only could cost millions of rands annually due to production downtime but also direct and indirect damages to machinery as well as compensation for loss of life. A vast number of failures can be avoided with relatively low cost maintenance simply by developing small maintenance programmes. These programmes can easily be carried out annually at very low cost. It is also important that maintenance programmes be discussed with the relevant insurance authorities as in some cases premium reductions may even contribute to this program.

The purpose of this paper is to demonstrate the importance of effective testing and maintenance programmes, making use of all the relevant testing methods including the latest on-line predictive testing and diagnostic methods with reference to the insulation of medium voltage switchgear. The most common problems and failures encountered in the last couple of years since we have adopted these latest techniques in conjunction with our standard methods and investigational procedures are also discussed.

• SPECIFICATIONS AND DESIGNS

Medium voltage switchgear has changed drastically over the last 20 years and this has resulted in more compact and reduced volumes for equivalent fault and thermal ratings. An important factor is that all materials used in the construction of switchgear have to be stable and reliable over a long period, in most cases well over 20 years. These materials need to maintain their design characteristics even in hostile environmental conditions and therefore type and ageing tests have been introduced and are specified.

The main purpose of an insulating material in medium voltage switchgear is to insulate the live component part from the earthed enclosure, which normally surrounds it. These materials can be solid, liquid or gaseous. The use of liquid insulation in medium voltage switchgear has dropped drastically over the last decade and unlikely to be used in new designs in the future. Air is still a very popular choice of gas by virtue of being cheap and easily available. Special precautions are however necessary in harsh polluted environments to ensure that it does not lose its physical, chemical and electrical characteristics. Contamination, caused mainly by dust and moisture continue to be the major problem areas. Where smaller volumes and higher voltages are required, the use of SF6, Sulphur Hexafluoride, has been the solution. This gas is good, not only for insulating but also for arc extinguishing duties. With the increase in demand for smaller compact medium voltage units we are also experiencing an increase in the call for GIS or Gas Insulated Substations with SF6 gas, sometimes only used as an insulating medium. Another special medium is vacuum but this is only used as an interrupting and not an insulating medium. With insulating materials having changed drastically, traditional solid materials such as mica, asbestos, slate porcelain, paper, glass and shellac are rapidly being replaced by a wide range of polymers and resins. The most common materials nowadays being dough moulding components, alumina and epoxy cast resin. These products allow flexibility in terms of the range of shapes as well as the number of conductors that can be embedded in them.

• IMPORTANCE OF PREVENTATIVE MAINTENANCE.

On line predictive diagnostics or assessment with minimum or no interruption is the desired situation and there is no doubt that extra testing may result in extended life. Various methods are available including infrared, partial discharge and ultrasonic on-line techniques.

Early signs and evidence of corona or partial discharge are crucial for the prevention of equipment failure.

Typical case studies are discussed for better and more effective results and long term reliability. A combination of the on-line predictive diagnostic methods mentioned above should be employed at regular intervals and all results clearly tabled for future analysis and comparison with the results obtained during commissioning on the newer installations. It must also be stressed that on most existing installations the difference between satisfactory acceptable and desired results is normally quite notable and fairly easy to comprehend. Even at the premature stages of failure they are misleading and difficult to isolate. In most cases there is a clear margin between the two conditions. One of the major problems encountered during the analysing process is because of the fact that in most cases the equipment is metal clad or metal enclosed resulting in the most detrimental developments happening behind metal barriers.

• ROOT CAUSES OF INSULATION FAILURE

Many regard the cause of corona and surface tracking as a conductive path between phases or phase and earth, similar to a conductive avalanche between the two different phases or between a phase and earth and insulation system. It is important to note that thermal ageing of insulation increases its vulnerability to many degrading factors. The thermal life characteristics of insulation cannot be inferred solely from the information on its composition. Track records are always a good indicative reference as most of the components used on medium voltage switchgear for insulation purposes require not only electrical properties but also mechanical and thermal qualities. The length of useful life of the insulating system depends on a number of parameters including site conditions. It is imperative that components subject to harsh conditions such as some of the ones mentioned below are regularly monitored.

- A dusty or polluted environment
- Corrosive atmosphere (i.e. coastal conditions, chemical plants)
- Frequent or continuous vibration
- High humidity
- High or "cyclic" temperatures
- Consistently high levels of overloading due to poor system design

In the early days air was used as an interrupting medium for medium voltage circuit breakers. Air is a good insulator at room temperature but deteriorates when its' temperature increases, resulting in a drastic decrease in resistance, almost linear to the increase in temperature. This is called ionisation of air and at this point there is an avalanche of electrons that begin to flow. This was addressed from the early stages on air circuit breakers by the design of the arc chutes.

As the intention is to discuss the enhancement of existing insulation systems already in place it must be assumed that basic required routine tests have been completed, therefore no major shortfalls or defects are present only the possibility of minor partially defective situations. These conditions are very difficult to detect and state of the art equipment is required to do the detection.

• CORONA

During development stages a lot of emphasis is dedicated to the study of insulation components to ensure that corona is non-existent. It is imperative that no sharp edges on conductors and connectors exist and all primary components should have rounded edges. Air gaps between conductors and surrounding insulation must be avoided. Under normal conditions stable air molecules are not polarised but when subjected to an overstressed alternating current electric field, the free negative ions attain sufficient energy to knock other free electrons from stable molecules in the air. This results in a runaway effect with more electrons knocking more free electrons and so on, producing negative and positive ions.

When the air molecules lose electrons they become polarised positive ions. Electrical stress causes oxygen molecules to form ozone, which is a strong oxidising agent and will attack most insulation when nitrogen is in the air. This has a negative effect on certain substances and when combined with moisture produces nitrous acid. Positive ions also produce a reddish coloured glow and negative ions produce a bluish glow as well as an am radio frequency signal. In most cases this arcing in air has a frequency between 100KHZ and 100MHZ. This reddish-blue glow is seen much easier in the dark in an enclosed environment without outside interference. This process is normally accelerated where poor ventilation is present as ions in the air reduce dielectric strength. It is common for nearby insulation surfaces to then be "damaged" with carbon tracking taking place. Continuous tracking results in carbon treeing in most insulating materials and eventual breakdown. During this process most materials lose their colour and a white

powder is formed as well as radio frequency noise and the smell of ozone will exist undetected. It is interesting to note that during development tests carried out over the years, if dust or light particles such as talcum powder are spread evenly over these areas they tend to be attracted to the high dielectric areas.

- **CORONA CASE STUDIES**

Corona related problems generally take place undetected over long periods of time unless sophisticated equipment is used for on-line monitoring or careful off-line inspections are conducted on individual compartments and chambers. Experience has revealed that older equipment is more prone to problems. An example is where older designs are in service with insulating boards segregating sections of a busbar run and where the joints between the busbar conductor and the insulating barrier are not fully homogenous and air gaps are present. We have come across many cases like this resulting in complete busbar blackouts with long and expensive outages. Another similar problematic area is on withdrawable type equipment where the safety shutters of the circuit breaker or even on a withdrawable instrument transformer do not open to a safe distance resulting in the respective primary phase monoblocks not clearing the metallic window frame sufficiently. This problem is more common on the earlier large window 3 phase units especially above 24kV. Another common problem area is where square busbars with rounded edges are used as primary conductors and the insulation material over the years begins disassociating itself at the more acute angle points and allowing micro voids to form which with cyclic loading eventually results in small air gaps. This type of problem has also been regularly found on a number of withdrawable circuit breaker bushings where over the years the impregnation has deteriorated drastically resulting in the paper "drying out" completely and resulting in the formation of voids. Another typical problem area is the cable compartment where the cable terminations are incorrectly carried out due to poor workmanship.

- **SURFACE TRACKING**

With most type tested switchgear designs, surface tracking will not reach critical stages unless a major deficiency develops. These so called third parties are normally contaminants, which together with moisture accelerate the flow of surface leakage currents. As previously mentioned reliable designs ensure that these leakage currents are maintained well below their critical values for the entire life of the equipment through calculation and accelerated life cycle tests. Although these methods have been perfected over the years, in many cases actual site conditions sometimes reach such compromising situations that conditions are created where excessive leakage values are found resulting in surface tracking. Conditions are extremely harsh where equipment is installed and commissioned within walking distance from the coastline where strong winds prevail as in the Western Cape. Areas with high relative humidity, high temperature and the presence of corrosive atmospheres such as on the Natal Coast are also potentially problem areas. Other applications to be carefully monitored are substations in the proximity of cement works or other polluted areas such as on our Natal Northern Coast during the burning of the sugar cane fields. These contaminated atmospheric conditions together with moisture have drastic effects on insulation. Surface leakage currents have destructive effects and over prolonged periods burning of the insulating surfaces takes place resulting in the creation of treeing patterns.

It must be pointed out that we have often also encountered this condition not only where contamination and moisture have been present but where original switchgear designs are underrated for the duty at which they are being used resulting in overstressed dielectric fields being created which increases the amount of leakage currents.

- **SURFACE TRACKING CASE STUDIES**

Typical cases encountered are on switchboards where busbar chambers are modified after initial installation to accommodate larger than original cross sectional busbar sizes which results in smaller clearance distances. Also on cable terminations where the specified minimum tail lengths are not adhered to and where current transformers are changed and creapage distances are reduced. We recently investigated a breakdown failure of a busbar chamber on a switchboard that had originally been commissioned 20 years ago and had been extended with two additional feeders. The original

manufacturer was not awarded the contract due to financial restraints and instead a smaller supplier was commissioned to complete the project. On the type of equipment in question, a very small modification is required around the busbar aperture to ensure compliance to the impulse level requirements. This modification did not take place and resulted in a flashover between one of the phases and earth. Another area where flashovers and breakdowns are common is where joggle and adaptor chambers are fitted without involvement of the original manufacturers or qualified engineers with a good understanding of the product involved. The company involved was not aware of the situation and did not consult the original equipment manufacturer, resulting in a high stress window.

• SYSTEM INFLUENCE & MODIFICATIONS

System conditions also contribute to a certain extent to insulation failures especially in networks where the equipment ratings (for example the system voltage parameters) are periodically exceeded when an abnormal condition persists elsewhere or when the associated protection fails to isolate a defective area.

• SYSTEM INFLUENCE CASE STUDIES

We recently witnessed a switchboard that failed in service after approximately 15 years of trouble free operation following the acquisition of an on load tapchanger and the upgrading of a number of switch-panels for power factor correction. Firstly, the tapchanger controls and associated circuitry were not properly commissioned resulting in a continuous and unnecessary over-voltage condition with significant results on the secondary 11kV network well in excess of the rated system voltage ratings of the equipment. Secondly, the power factor monitoring equipment was also not correctly specified and designed resulting in continuous over-voltage surges being impinged in the system and the combined abnormalities resulted in a catastrophic busbar failure due to a breakdown of the insulation dielectric.

• SITE MODIFICATIONS AND RETROFITS

Site modifications and retrofits must also be carefully studied before being concluded. Due to the costs involved and the shortage of available capital we often witness unqualified personnel being authorised to carry out modifications and retrofit tasks on existing equipment without the correct knowledge and ability. Although a lot of these projects accomplish a certain degree of initial saving they in most cases result in under specification and short term solutions. Typical disastrous cases involve retrofitting existing bulk oil filled circuit breakers with combinations of HRC fuses and high switching duty contactors. The original truck and carriage as well as the top plate with its original monoblock bushings are used but the switching chamber is converted into an assembly where the high rupturing capacity fuses and the contactor are fitted. In-house tests have found these units to be derated by approximately 50% in terms of impulse and 30% in terms of power frequency voltage withstand abilities. Upgrading of busbar configurations without prior clarification from the original manufacturer is another area where insulation levels are not achieved, with drastic results.

This problem has also been encountered where original specifications of current transformers are changed for much lower ratios with the same VA characteristics resulting in large core volumes without changing the original phase to phase and phase to earth clearances. This obviously results in reductions in available clearances and creapage distances.

• ON-LINE ANALYSIS FACILITIES AND PORTS

On-line analysis has become more feasible and popular due to the development and reliability of test equipment improving. The major advantage of on-line analysis is that this can be done without long and costly outages and predictions of problem areas can be made. On-line prediction testing can prevent the cost and downtime associated with equipment failure due to the fact that problem areas are detected prior to failure taking place.

On-line analysis methods should compliment traditional off-line testing methods and not replace them. Off-line testing results in partial or complete system shutdown and should follow indications of potential problems identified by on-line testing.

As most available methods for predictive diagnostics are based on a line of sight device it is critical that this is taken into consideration when specifying new equipment. With minor modifications it is possible to achieve effective solutions, which are suitable for accurate measurement and analysis of all activities taking place within the various medium voltage compartments. These designs will not only facilitate the on line investigations but would also minimise outages and increase system reliability. These modifications facilitate different tests that cannot be carried out while the equipment is energised with all its "real life" parameters. With careful and strategic engineering these innovative ideas can be introduced in most designs without compromising the safety of the operators and the integrity of the equipment. With these innovative methods one can access and monitor the various conditions on a regular basis or permanently by having on-line sensor devices fitted either temporarily or permanently.

• PARTIAL DISCHARGE MONITORING

Partial discharge is defined as electric discharges which do not bridge electrodes. Examples of this type of discharge are discharges in a cavity in a solid dielectric (i.e.) both electrodes are shielded from the discharges by the solid, discharges on a surface, (i.e.) at least one electrode is shielded by a solid dielectric, and discharges around a sharp point at high voltage (i.e.) the discharges are shielded from one electrode by a column of non-ionised gas. Although the magnitude of such discharges are usually small they can cause progressive deterioration and ultimate failure, therefore it is essential to detect their presence. Partial discharge belongs to a far greater group of gas discharges. In all these discharges gas molecules are ionised by the impact of electrons. Newly formed electrons gain speed in an electric field, ionising more molecules by impact and an avalanche of electrons is formed. The electrons in the avalanche and the ions left behind move towards the electrodes, thereby forming a passage of current through the gas.

Due to the ever increasing necessity for reduced scheduled outages, as required by most traditional preventative maintenance programmes, a great deal of research and development has taken place with regard to partial discharge technology. Nowadays it is possible with sophisticated instruments coupled to either temporary or permanent sensors to not only collect data on partial discharge activity but also to analyse it and generate reports with complete noise elimination. These instruments are ideal for situations where accessibility behind metal barriers used in the construction of metal enclosed or metal clad switchgear cannot be easily accessed. Another major advantage with this technique is the ability to detect and isolate the faulty section before the scheduled outage allowing extra planning.

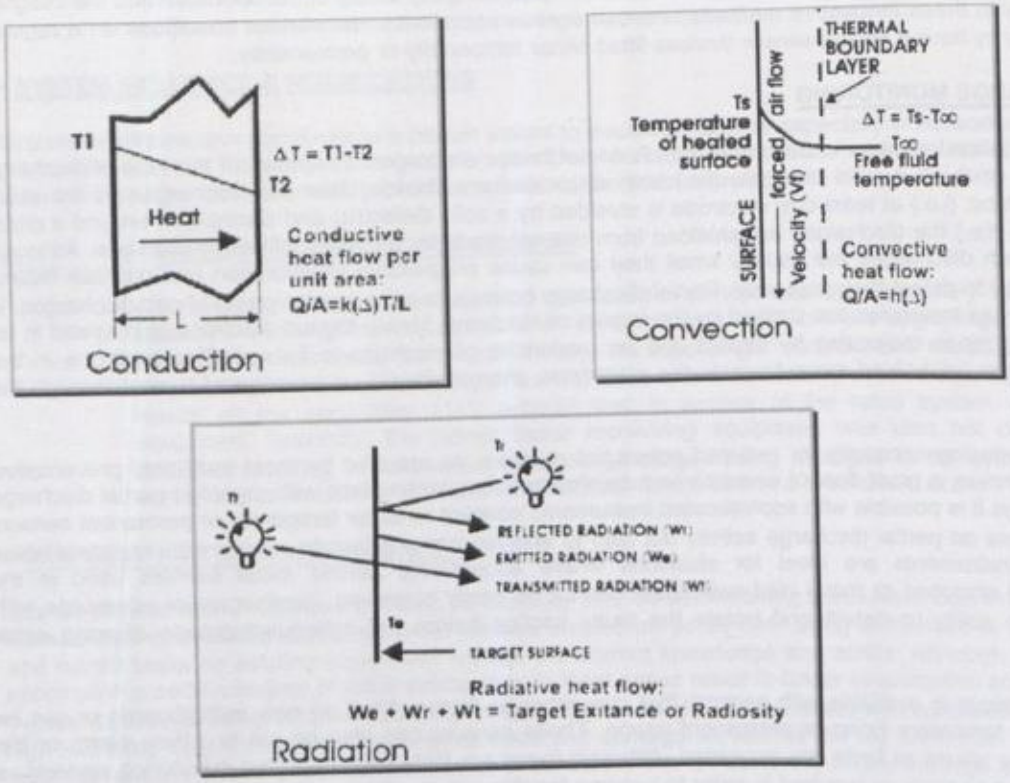
This monitoring technique is available with sensors that can either be factory fitted on new switchboards or can be retrofitted on site for temporary fixing or permanent usage. These sensors can also be set to initiate alarm or trip conditions if activating values or limits are exceeded. Although these are fairly uncomplicated monitoring systems, a certain degree of trend analysis is required in order to become familiar with the responses received.

• INFRARED MONITORING

Infrared imaging and recording instruments are available which use the measurement of the infrared radiant energy received from any single point on the target surface. This is normally the surface where the pointer is placed on the image screen, to calculate an approximation to the true temperature at that location. With most instruments an assumption is made that the infrared absorption of the air path between the target and the instrument is negligible. No infrared energy is transmitted through the target from sources behind the target. With these sophisticated instruments it is also possible to calculate and correct certain parameters such as the reflection of the ambient background radiation and a value for the target emissivity parameter.

It is important to note that most of the instruments used measure the temperature based on radiant heat transfer. In order to simplify and understand the three modes of heat transfer namely; radiation, convection and conduction, a simplified set of diagrams is shown below.

Figure 1: Three modes of heat transfer



• RADIANT HEAT TRANSFER

Radiative heat transfer is unlike the other two modes, in that:

- It can propagate through a vacuum.
- It occurs by electromagnetic emission and absorption.
- It occurs at the speed of light and behaves in a manner similar to light.
- While conductive and convective heat transferred between points is linearly proportional to the temperature difference between them, the energy radiated from a surface is proportional to the fourth power of its absolute temperature and the radiant thermal energy transferred between two surfaces is proportional to the third power of the temperature difference between the surfaces.

Thermal infrared radiation leaving a surface is called radiant exitance of radiosity. It can be emitted from the surface, reflected off the surface, or transmitted through the surface, as illustrated in Figure 1. The total exitance is equal to the sum of the emitted component (We), the reflected component (Wr), and the transmitted component (Wt).

The surface temperature, however, is related only to the emitted component (We). The measurement of thermal infrared radiation is the basis for non-contact temperature measurement and infrared (IR) thermography. The location of the infrared region in the electromagnetic spectrum is illustrated in the Figure 2.

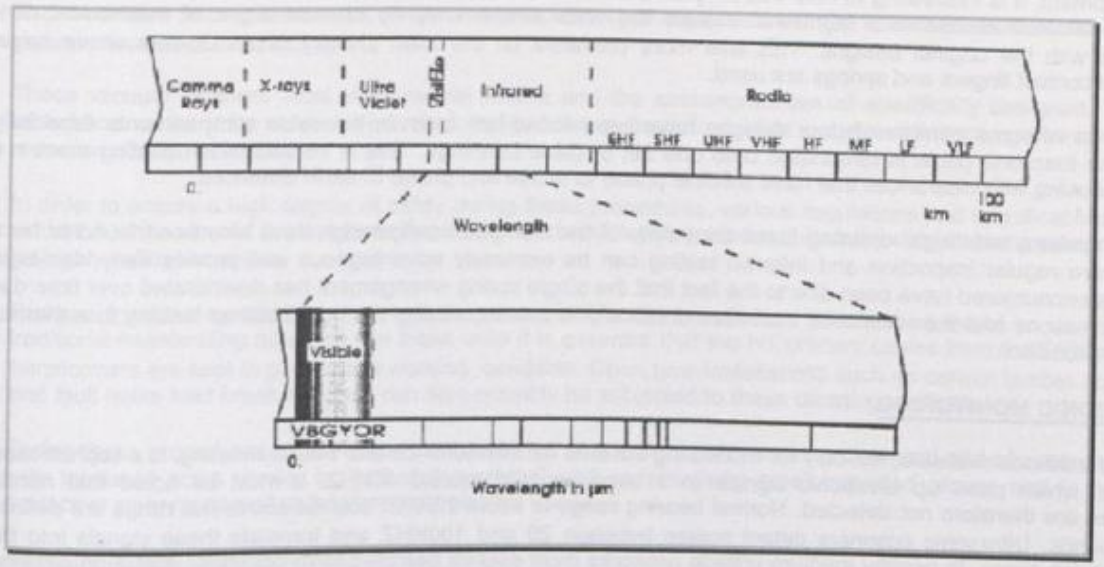


Figure 2: Light and infrared in the eltromagnetic spectrum.

While light energy transfer takes place in the visible portion of the spectrum, from 0.4im to 0.75 im, radioactive heat transfer takes place in the infrared portion of the spectrum, between 0.75 im and about 1000im. Most practical measurements are restricted to wavelengths less than about 20im (the symbol im stands for micrometers or "microns". A micron is one-millionth of a meter and the measurement unit for radiant energy wavelength).

All target surfaces warmer than absolute zero radiate energy in the infrared spectrum. Very hot targets radiate in the visible as well. The heating element of an electric stove at 800K glows a cherry red and as it cools it loses its visible glow but continues to radiate. This radiant energy can be felt by placing ones hand near the surface. The glow is invisible because the energy has shifted from red to infrared. Infrared thermal imagers measure and display images of this infrared radiated energy.

When the infrared radiation from a target is measured it has to pass through some transmitting mediums on its way to the infrared instrument. If the medium is a vacuum, there will be no loss of energy, but most infrared measurements are made through air. The effect of most atmospheric gases can be ignored for short distances, such as a few meters. As the path length increases, however, atmospheric absorption can be a source of error. There are two spectral intervals that are relatively free from absorption losses. These are known as the 3-5im and the 8-14im atmospheric "windows". Almost all infrared sensing and imaging instruments are designed to operate in one of these two windows.

Since most measurements using this method are made through a relatively short atmospheric path (less than 10 meters), errors due to atmospheric losses can generally be ignored. Solid media, however, such as glass or quartz viewing ports used in some manufacturing processes, can seriously attenuate infrared energy if situated between the target and the infrared instrument, and can make temperature measurement difficult. In these cases, the spectral transmission and absorption characteristics of the medium must be taken into consideration in calibrating the instrument. This has been the case in a number of investigations carried out where special inspection windows have been fitted for the purpose of on-line preventative maintenance.

It is interesting to note that although all investigations using these instruments require line of sight approach, a number of defective components have been discovered by comparing the temperatures on similar covers and then isolating the units with higher recorded values and conducting further off-line tests. This method has proved

successful on individual type compartments but not on collective chambers such as busbar chambers, as in most cases the temperature differentials have not been that noticeable. The slightly on-line type modified covers also facilitate these operations with excellent results without interference with the normal operation and original certification of the equipment. It is interesting to note that in most cases with withdrawable circuit breakers where the temperature recordings showed excessive or abnormal values, the units almost uniquely showed signs of mechanical non-compliance with the original designs. This was more prevalent on the main primary circuit clusters where large numbers of contact fingers and springs are used.

Another area where a number of poor designs have been found has been in the cable compartments especially where more than one cable is terminated onto one set of cable bushings. This is instead of terminating them in a standard housing with clearances that have suitable phase to phase and phase to earth distances.

Switching systems with high rupturing fuses especially of the clamped configuration have also been found to be a design where regular inspection and infrared testing can be extremely advantageous and provide early warnings. Most faults encountered have been due to the fact that the single spring arrangement has deteriorated over time due to various reasons and the resistance increases drastically in turn increasing the heat build-up leading to a thermal breakdown condition.

• ULTRASONIC MONITORING

One of the methods available, not only for monitoring but also for maintenance and troubleshooting, is a sophisticated instrument, which picks up ultrasonic signals in a band typically around 40KHZ. It must be noted that normal frequencies are therefore not detected. Normal hearing range is about 20KHZ, sounds above this range are defined as ultrasounds. Ultrasonic scanners detect noises between 20 and 100KHZ and translate these signals into the human hearing range. In healthy medium voltage networks most sounds detected have constant ultrasound patterns. However, when deficiencies are present, changes in these "sonic signatures" are easily recognised.

These changes are normally recognised by a trained operator and pinpoint potential inferior insulation systems. In medium voltage applications ultrasonic detectors are only used in the scanning mode except for very special applications such as the assessment of the mechanical bellows on vacuum interrupters which requires the detector to be in a contact mode. In most routine inspections we attempt to log corona discharges in decibels as well as the ambient temperature and relative humidity to enhance the validity of future subsequent comparisons. Where possible all equipment inspected is noted for future reference.

One important factor to remember is that most corona failures are unpredictable and a number of tests conducted show that although corona and arcing were not detected by infrared inspections as sufficient heat was not present, problems were positively identified by ultrasound equipment. Computer programmes are also available which allow trend analysis to be formulated to certain pre-specified levels to ensure consistency and ideal comparison, enabling deterioration to be realistically monitored. Where possible these signals are amplified and then heterodyned down to audible frequencies which can be heard via a padded headset or built-in loudspeakers. With most available instruments volume and sensitivity can also be separately adjusted.

The high frequency hiss or noise emitted by the abnormal electrical discharges are picked up by a high sensitivity microphone. Most of these units are also fitted with analogue meters suitable for use where sound is not to be used and the intensities and deflections need to be observed. On some of the tests conducted it was possible to detect ultrasound signals even in very noisy industrial environments. One important characteristic of most devices available is that they also have a sonic mode of operation in addition to the ultrasonic mode. This has been extensively used in the monitoring of the mechanical bellows on vacuum interrupters. In this mode these devices are used as standard electronic stethoscopes. These airborne non-contact instruments are normally lightweight portable, handheld and battery operated. It is also important that the heterodyning permits the audible signal to retain many of the characteristics of the original high frequency sound.

• LIVE CLEANING OF MEDIUM VOLTAGE SYSTEMS

With the ever increasing demand on electrical utilities for a better quality of supply with minimal interruptions, preventative maintenance methods and procedures are continuously being developed and although still not very popular in South Africa, live cleaning of medium voltage systems is a reality in other countries, especially in Europe.

This is normally carried out by specifically trained electrical engineers with several years of maintenance of electrical installation and network experience.

This innovative technique consists of dry vacuum cleaning of equipment using a special vacuum cleaner coupled to vacuum nozzles or brushes.

These vacuum cleaners must meet certain criteria and the accessories are all specifically designed. Test results tabled from some of the overseas exercises have shown a drastic reduction in the partial discharge condition once the reduction of dust took place.

In order to ensure a high degree of safety during these procedures, various regulations and specifications have been written. It is the view of its designers that due to rigid and sophisticated requirements live cleaning personnel need to be highly safety conscious.

Perhaps from our current point of view, the area which could benefit from this method would be compact cells or traditional freestanding minisubs. On these units it is essential that the HT primary cables from the T/Off circuit to the transformers are kept in good clean working condition. Open type installations such as certain busbar configurations and fault make load break switches can also possibly be subjected to these cleaning methods.

During these procedures all work must be conducted at specified safe working distances and all work must be done with insulated poles similar to "hot stick working" and special (long type) insulated gloves and in some cases protective screens as well as barriers may also be used.

• TRADITIONAL OFF-LINE INSULATION TESTS

• POWER FACTOR AND DIELECTRIC MONITORING

Although this testing method is only conducted off-line it is still one of the most convincing analysing methods that can be used to determine dielectric properties and conditioning. Most instruments available measure the dielectric loss, which is a measure of the losses occurring in the material when an alternating electric stress is applied. In order to understand this method it is important to note that when an alternating stress is applied to a perfect dielectric such as dry air or vacuum, the current passed is a pure capacitance current which leads the voltage by a phase angle of 90°. However, in reality all other dielectrics used in electrical applications have characteristics with dielectric conduction and other effects such as dielectric hysterisis which results in a certain amount of energy being dissipated in the dielectric which in turn results in the current leading the voltage by a phase angle of less than 90°.

The value of the angle which is complimentary to the phase angle is therefore the measure of the losses occurring in the material when subjected to an alternating electric stress.

This complimentary angle is known as the loss angle. As this angle is usually quite small, the power factor can be taken as equal to Tanδ.

The energy loss in watts is V^2 CW Tanδ where V is the applied voltage, C the capacity in farads and W = 2çf, where f is the frequency in hertz. This loss, known as the dielectric loss, is seen to depend upon the capacity, which, for given dimensions of dielectric and electrodes, is determined by the permitivity of the insulating material. Dielectric losses are
therefore determined to a great extent by the power factor (Tan δ) and permitivity. This being one of the reasons why in practice a lot of insulating materials are compared by the product of these two (i.e.) K Tanδ. We must also note that the losses are proportional to the square of the voltage.

Values of Tanδ usually increase with an increase in temperature especially if moisture is present as well as permitivity which also rises with the temperature. It is therefore important to note that dielectric losses are liable as temperature increases as this is the root cause for electrical breakdown in insulation as a cumulative situation is created which results in thermal instability and finally into breakdown. This failure phenomenon is sometimes experienced in moulded components where continuous overloading results in

too much heat being generated in the interior but not being dissipated fast enough and breakdown occurring on the insulation.

These conditions have been more prominent especially on capacitor feeders where overloading and higher frequencies are involved. Over the years we have encountered a number of failures due to the specified equipment being unsuitable for the application as in most cases the abnormal frequency requirements not being taken into consideration during the original design and thus resulting in premature breakdown of the insulation and failure.

- **POWER FREQUENCY DRY TEST**

This is the most popular test which can be carried out to access the strength of the insulation of the primary circuits but can only be conducted in an off-line condition. This test is carried out in accordance with the standard specification relevant to the equipment or switchgear which is to be tested (e.g. IEC56, 129 etc.). It must be noted that although very sophisticated test sets are commercially available, basic equipment is also available which is cost effective and capable of reproducing real conditions. It is extremely important to note that during maintenance tests all values specified for new equipment are derated depending on the age of the equipment being maintained. In some cases where the equipment has been in service for many years it is possible that the rated power frequency withstand voltage applied may only be equal to the nominal system voltage. Ideally in these conditions this test should be combined with the other technologies being discussed. The test voltages to earth and between phases should be applied to the phase conductors of the main circuit in succession with the other phase conductors connected to the frame and to earth and continuity assured i.e. by the closing of the switching devices.

Any disruptive discharges are a clear indication of future failure.

- **INSULATION WITHSTAND TEST – MEGGER TEST.**

Although this method is not normally used on primary circuits it should be considered during maintenance procedures if no other methods or equipment are available to attempt to establish the integrity of the insulation resistance. A number of cases have been experienced where the presence of vermin (e.g.) spider webs were identified with this method and prevented the possibility of on-line failures. It must be noted that with this method it is generally difficult to advise what value of resistance should be obtained but typically on main circuits an insulation resistance of 1000 MOHMS would be an average figure. The weather can also affect the results, a warm humid day tends to lower the value whereas a cold day gives higher values.

- **VENTILATION, COOLING AND AIR CONDITIONING OF SWITCHGEAR AND ASSOCIATED INSTALLATIONS AND SUBSTATIONS**

When switchgear and associated substations are engineered, ambient as well as system conditions such as the thermal loads should be taken into consideration to ensure that an almost ideal environment is created. This is normally achieved by a number of over-designs or tolerance margins and/or by reducing the effects of thermal loading with the assistance of ventilation, cooling and air conditioning systems. Heating systems are also used but are not as popular in South Africa for obvious reasons.

It is therefore important that during periodic maintenance these parameters are monitored and where higher temperatures than normal are being experienced that one of the above methods be considered.

- **ABNORMAL SERVICE CONDITION**

Although most equipment is developed, engineered and manufactured with certain rating characteristics as specified by the relevant applicable specifications, these are based on "typical" substation sites and conditions. These specifications may not necessarily take the following abnormal conditions into account:-

- **HIGH HUMIDITY**

High humidity alters the dielectric properties of atmospheric air. It is common knowledge that with high values of humidity (i.e.) >80% RH mark, the tendency of flashover across insulation surfaces may

increase considerably. High humidity can also increase the magnitude of corona discharge, lower discharge inception levels and increase surface conductivity due to moisture contamination, particularly when dirt and other forms of pollution are prevalent.

- **TEMPERATURE**

Where ambient temperature fluctuates to any great degree, special attention must be paid as these high to low temperatures may result in high levels of condensation. Fast cooling of humid air, such as during a tropical rainstorm, results in the saturation vapour pressure being exceeded and if accompanied by rising humidity results in the deposition of condensation onto cool surfaces such as metallic parts of switchgear enclosures and mechanisms.

These parts can have long thermal time constants and consequently do not respond rapidly to fast ambient temperature changes. Cyclic temperature variations always result in pressure changes which in turn results in "breathing" which can create the ingress of humid air and airborne pollutants. The phenomenon must be carefully monitored especially in compound filled cable boxes and oil filled tanks such as the ones in ring main units.

A high number of failures have been caused by this phenomenon where the semi-fluid dielectric is contaminated by water and the lowered dielectric between phases resulted in a three-phase fault.

- **CONDENSATION**

Condensation is a serious hazard to all components of medium voltage switchgear. When there is condensation and electric fields the production of highly corrosive pollutants takes place.

Insulation which is free from external discharge also known as tracking can be affected when electric fields become distorted due to the presence of a layer of surface condensation. These discharges result in the production of highly reactive radicals, notably ozone (03).

Excessive condensation also results in accelerated corrosion of not only ferrous metals but also zinc and aluminium.

It is important when installing new medium voltage switchgear that the relevant "drying periods" are observed to ensure that the substation buildings do not have wet floors and walls.

- **MOISTURE**

Moisture must be controlled or completely eliminated if possible. Although certain sources such as leaking roofs and dripping conditions underground can be dealt with, high humidity, fog and mist encountered in certain applications are difficult to reduce and control. Moisture can in many instances penetrate and be absorbed into many types of organic insulating materials such as paper bushings commonly encountered on minimum and bulk oil breakers. Insulating medium such as varnish is used to reduce this problem. All attempts must be made to reduce the possibility of vulnerable areas being exposed to moisture.

Surface moisture, especially when combined with dust particles can create a layer of conducting film which will increase the leakage currents, especially where high electrical fields are present. Busbar and joggle chambers, especially on higher fault systems, must be regularly cleaned to avoid the formation of these conducting films along their high number of busbar supports and post insulators. It is important that the term moisture is not limited to water vapour but to any vapour which may increase the presence of conductive leakage currents.

It is common in various parts of our country to have substantial drops in temperature during the night which in turn results in condensation. The problem is commonly found in switchgear housings especially

cable boxes when poor ventilation designs are present. It is normally recommended that if unacceptable values of moisture are found during routine maintenance in any switchgear compartment it is possible to operate at various temperatures due to the different electrical and heating distributions and as air is not always free to move, temperature and humidity differences may result in different dew points. This phenomena was experienced for example on a switchboard between the main 2500 amp incomer and the adjacent 400 amp local transformer feeder where the temperature differences were significant and condensation was found to be excessive on the one panel but not on the other. The practical solution was then to increase the air circulation and reduce the temperature and humidity difference. Another common problem area is where outdoor free standing ring main units are installed in remote areas with high humidity characteristics and mounted on concrete plinths without any sealing between the cable trench and the unit and with cable trenches that are not "back filled".

It is also important that these units are installed in positions not subject to water concentration due to poor drainage facilities.

- **ATMOSPHERIC POLLUTION**

The most common form of atmospheric pollution is dust. It is important that on sites where pollution is expected in any form, special precautions be taken. Invisible atmospheric pollutants such as various salts, smoke, and carbon monoxide are reduced as they accelerate the corrosive processes.

- **VERMIN**

As is commonly known small mammals, snakes, lizards, frogs and insects look for warm dark places such as switchgear compartments. Rats and mice nibble at the PVC coating on wiring and conduits as well as untreated wooden clamps and certain plastic components and gaskets. It is therefore important that the selection of various vermin shields or gaskets are given fair consideration. Efficient vermin proof designs are often complicated by the need in many instances for good ventilation. When moisture and dusty environments are present, fungus must also be carefully monitored. We have on record a number of switchgear failures due directly to vermin entering high voltage enclosures.

• EARTHING

One of the main considerations in any medium voltage design is the provision of a suitable earthing arrangement whether it be for the system neutral, equipment frames or lightning protection. The major importance of earthing lies in the fact that it deals with safety. In power systems it helps to maintain the voltage of any part of the network and associated equipment at a definite potential with respect to earth. It also allows enough current to flow under fault conditions to operate protective devices that are installed in the circuit, thus preventing exposed conductive parts of the equipment from rising in potential for a period sufficient to cause danger from electrocution. The purpose is to limit the potential of live conductors in relation to earth, to values consistent with the insulation of the system, thus avoiding its failure under fault conditions.

With the ever increasing theft of metals such as copper and aluminium, it is important that earthing systems are monitored and regularly checked. All earthing busbars, earthing cables and electrodes on the system should be adequate to carry the fault currents without dangerous temperature rise or voltage gradient along the earthing system. Over the last couple of years we have witnessed a number of failures due to breakdown of dielectric of the equipments' insulation materials due to absence or incorrect system earthing of the equipment as it was connected and not used as originally intended to perform its design capabilities and requirements.

• VOLTAGE DISTRIBUTION IN SOLID INSULATION

In solid insulation, breakdown by puncture is a complex process depending on a lot of factors. However, one important factor is the homogeneity of the material. Its structural uniformity is critical as well as the absence of impurities or voids.

In most solid insulation materials, we are able to determine a time/breakdown relation curve as the breakdown strength is time dependant.

As time increases, thermal factors are introduced and in most cases this leads to internal heating. This condition will ultimately result in a runaway and eventual breakdown. Although major attempts are made by development engineers during design to ensure that a given insulating material will perform and behave satisfactorily during its lifespan, it is not easy to predict its characteristics, especially under varying parameters unless sophisticated ageing tests are conducted and a service path graph is formulated. However, this is easier said than done and in most cases similar designs with relatively good results are used instead of new technologies to avoid failure in service.

It is therefore imperative that new insulating materials are subjected to harsh environmental tests combining temperature and humidity and in some cases artificial pollution to obtain similar conditions to those experienced in the field.

Since the early days engineers have pursued the principle that in order to achieve good insulating components we should seek materials that have uniform field distribution and this can be clearly seen even from the earlier designs where impregnation was used. From these early designs the impregnation process has reduced the number of air pinholes and therefore reduced the amount of localised stresses.

In designs the three most important parameters for the study of insulating materials consist of the knowledge and understanding of at least the permitivity, the dielectric loss angle and electric strength.

It is imperative that all insulating materials are kept within their maximum operating temperature parameters. Most standard epoxy resin products have a maximum operating temperature of approximately 90° to 95°C. If higher operating temperatures are required, special hardeners must be used in order to increase the operating temperatures, sometimes at the expense of a reduction in mechanical strength. With most reliable designs it is also found that in order to avoid overstressing which could lead to ionisation due to different relative permitivity values, for example air and insulation materials, certain conditions are applied and developed. Some of these cases are as follows:-

(i) Multiple condenser foils in bushings
(ii) Single foil or earth screens
(iii) Increasing the thickness of insulation
(iv) Increasing the size of the air space

These methods are clearly represented in the relevant diagrams and for the purpose of our discussion it is important that maintenance engineers are aware of these designs as on a number of cases investigated, we have found units in service where the relevant earth screens are not kept correctly connected. Depending on the various designs this open circuit condition of the earth loop results in the voltage gradients across the insulation and air gap no longer applying and therefore a dramatic increase in stress.

• GENERAL NOTES ON AIR CLEARANCES

It is important to note that over the years the relevant specifications which cover air clearances have changed from older British standard 116 and 162 which specified minimum air clearances for given system voltages to a later specification such as IEC 694 which specifies impulse levels for particular rated voltages without associating the impulse requirements to physical dimensions. It is important that manufacturers and users are fully aware of this specification as minimal changes to the original design such as interference with existing insulation barriers, taped joints or even a reduction in creapage distance can have a detrimental effect. Voltage Transformer risers need special attention during routine maintenance as most designs are engineered with very tight engineering insulation tolerances making these connection points very vulnerable to breakdown should other associated parameters be interfered with.

• GENERAL NOTES ON COMPOUND OR OIL FILLED BOXES

It is important to note that when maintenance is being carried out on medium voltage equipment, especially where fabricated type cable boxes and adaptor or joggle chambers where compound or oil are used for insulation dielectric purposes, that over the years of service with the expansion and contraction of the filling medium no abnormal situations have developed. With most reliable designs this is taken into consideration during development and design stages, however as previously pointed out with abnormal service conditions, the superfluous can take place.

Typically BS 2562 requires that where cable boxes are designed, the expansion space shall be greater than or equal to 8% of the volume of the filling medium at 15°C. It is also important that in the case of a box with bushings on top, for example the level of the filling medium is governed by the creapage distance and should not be less than 50mm for bushings up to 11kV.

Where bushings are side mounted, the filling medium must be at least 40mm above the bushing. On most failures investigated on the cable boxes, we have found that these basic requirements were not followed during the installation stages and with time surface tracking led to failure. This is of utmost importance especially on cable boxes installed outdoors in harsh climates.

• FINITE ELEMENT ASSESSMENT OF TYPICAL INSULATING DESIGNS

With the modern technologies available it is possible to submit any bushing, insulator or other insulating component used on medium voltage switchgear for finite element analysis in order to develop and design components that can perform well within their electric field strength limits. These development studies ensure that the positioning of the various conducting and insulating components as well as any screens can be confirmed at early development stages. This is done by comparing the various shade plots produced by different configurations and layouts to provide maximum reliability.

Good understanding and knowledge of these studies can be beneficial and assist when conducting predictive maintenance as this will result in optimal efficiency assessments. In the extreme condition it is even possible to remove any suspect component and conduct tests and compare with the original prototype shade plots and analyse the developments on the particular suspected component.

• CONCLUSION

Although rigorous maintenance of medium voltage switchgear may not always be required because of less demanding mediums used nowadays, maintenance in general ensures the safety of personnel and plant, improves reliability and availability and reduces breakdown costs in the long term. Although many consider the inconvenience caused by planned shutdowns to facilitate such maintenance not worthwhile, it is necessary for equipment to be well maintained and in sound condition. With the development and refinement of instruments in the field of predictive on-line testing it is now possible to a certain degree to monitor on-line the condition of insulation with a high degree of accuracy and at least isolate and reduce the maintenance costs considerably. It must however be stressed that in most cases investigated better results were achieved when more than one of the above methods were simultaneously used which ensures maximum reliability by complimenting each other.

We must also note that the three on-line methods previously discussed can easily be simulated with off-line traditional testing methods and test equipment and this will ensure a better understanding and a clear reflection of the insulation condition of the component or piece of equipment under investigation. During previous investigations we also experienced that upon on line detection the traditional methods were required in order to create a condition of installation failure and clear identification.

REFERENCES

1. BS 6867 – 1987 – Maintenance of Electrical Switchgear for voltages above 36kV.
2. Blower, R.W. "Distribution Switchgear" Collins Professional and Technical Books.
3. Lythall, R.T. "The Switchgear Book".
4. Dr F.W. Kreuger "Discharge Detection in High Voltage Equipment" – Eywood Book.
5. Insulating Oils for Transformers and Switchgear by Castrol Industrial.
6. ASEA Brown Boveri – Pocket Book – Switchgear Manual.
7. Handbook of Electrical Installation Practice, Second Edition by E.A. Reeves.

8. Electric Power Transmission and Distribution by P.J. Freeman.

9. Contracting out of Mainten ance in a Municipal Electricity Undertaking by G.D. Jordaan of C.A. Du Toit & Partners.

Residential Water Heating Load Management

Author & Presenter: Christopher Forlee, BSc(Elec. Eng) – Chief Consultant, Eskom Enterprises

1. Introduction

The development of a Demand Side Management program by Eskom started in 1996. Research into electricity consumer patterns had shown that the Residential sector was a significant contributor to the national system peak demand in the morning and evening.

Further investigation into the electricity consumption patterns of the Residential consumer revealed that water heating load makes up a significant proportion of the Residential sector's contribution to the annual national peak electricity demand.

The inclusion of a residential water heating load management strategy/programme in a national Demand Side Management plan for South Africa is therefore essential.

2. The national water heating load profile

As a first step, the country's residential water heating load needed to be quantified (modelled) if it was to be properly understood and targeted with demand side management measures. There were estimated to be some 600 000 households under the control of a substantial number of geyser load management systems in South Africa in 1996/7.

A plan was devised to obtain the information/data required for the formulation of water heating models using these existing water heating load management systems (ripple & radio) and gave rise to the so-called "notch testing" program.

The meaning of a "notch" is the activation of all the load management receivers (switch geyser off) for a short period of time (typically 5 minutes) after which all the geysers are switched back on. The resultant dip in the load profile is what is known as the "notch" and represents all of the geyser load present at the point in time the shed was executed.

Repetition of this procedure at periodic intervals (typically 30 minutes) over a period of time (e.g. a day) yields the water heating load profile. In addition to the standard notch test it is possible to perform capacity and cold load pickup tests to determine the connected geyser load as well as the rate at which the geyser load "picks-up" or increases while a group of geysers is switched off and kept off.

The notch testing program involved 12 municipalities situated around South Africa and included an estimated 124 207 of the 600 000 relays reported to have been installed at that time, making for a substantial sample. The breakdown of relays per municipality is given in Table 1 below.

Municipality	Relays (Estimated)
A	35 000
B	25 000
C	11 000
D	9 000
E	8 352
F	8 000
G	7 500
H	6 000
I	4 500
J	3 655
K	3 200
L	3 000
Total Relays (Estimate)	124 207

Table 1.

The graph in Figure 1 below for Municipality E shows the demand profile for a test day where a combination of cold load pickup and notch testing was done.

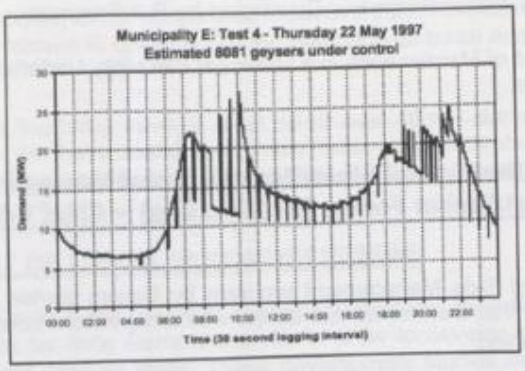


Figure 1.

The execution of notch, cold load and capacity tests for each of the 12 municipalities was completed over the period of a year (1997/8) by way of a test period (2 weeks) to cater for each of the seasons (winter, spring, summer, autumn). Tests were conducted simultaneously at all 12 sites during the test periods.

The data collected during the notch test program allowed amongst others the quantification of the water heating load profile for the sample. The demand curve is given in Figure 2 below.

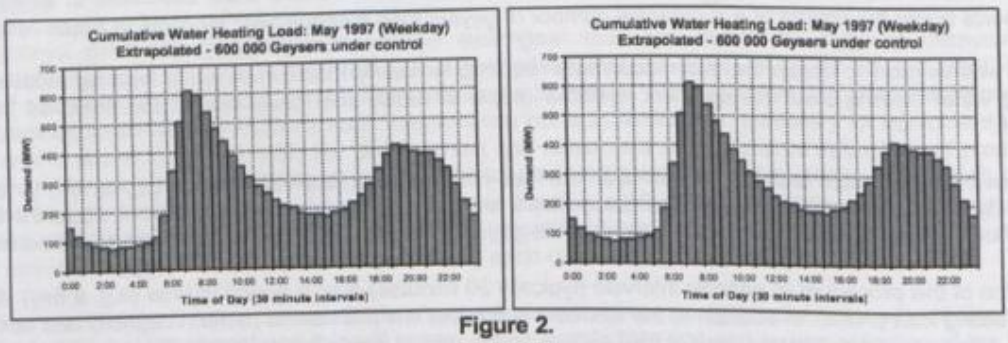


Figure 2.

At the time the potential target base was estimated to be some 2.4 million "urban formal" households. A conservative estimate of 1 geyser per household yields the national water heating load curve given in Figure 3.

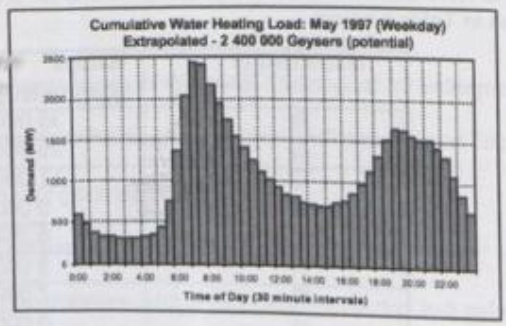


Figure 3.

The estimated winter water heating load present during the national morning and evening peaks is in the order of 2.5GW and 1.6GW respectively, of this, 25% is considered to be accessible through existing load management systems.

The existence and quantification of this substantial amount of potentially manageable load during the national system peaks gave rise to further research during the period 1998-2000, aimed at the co-ordination of the currently installed national load management capacity, the so-called Comricon project and new or greenfields future capacity, called Flexicon.

3. Co-ordinated Municipality Ripple Control (Comricon)

This program was aimed at the co-ordination of existing load management systems nationally through a centrally located scheduling entity.

The data collected during the notch testing program was used to develop models that would allow optimisation of the load management at each local site whilst allowing additional utilisation of addition load shift to the benefit of the national system.

Equipment was developed to allow interfacing between the local controller (proprietary) and the central scheduling entity.

A substantial information technology, metering and communications infrastructure was developed during the course of the project. The myriad of equipment, technologies, models and software developed and utilised during the course of this project are too many and complex to be discussed in this paper.

During 1998 & 1999, co-ordinated tests were conducted to evaluate the additional benefits of co-ordinated load scheduling and the possibilities of utilising manageable load in lieu of generating load for the national system reserve. It was found that there were indeed additional benefits to be gained from the co-ordinated scheduling of water heating load for both the local supply authority as well as the national system.

The project culminated in the successful co-ordination of 12 individual load management controllers in August 2000 yielding a morning and evening managed load of 180MW and 95MW respectively. The demand curve of the morning test is given in Figure 4.

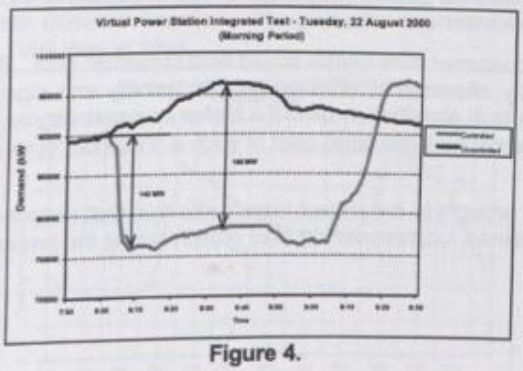


Figure 4.

The Comricon project in turn gave rise to what is called the Virtual Power Station (VPS). The VPS is in effect a scheduling entity that can be used to co-ordinate or schedule a variety of manageable or interruptible loads, Comricon being one of them.

The ultimate objective of the VPS is to allow the utilisation of manageable or interruptible load for the optimisation of the national electricity supply with associated financial incentives.

It will also be possible to provide additional services to the local supply authority through the VPS such as remote accessibility to their load management through a web-browser interface through the internet negating the need for dedicated dial-in facilities and associated software amongst others.

4. Flexible Hot Water Load Management (Flexicon)

Subsequent to the completion of the notch testing program much analysis and modelling of residential hot water usage patterns was concluded. As indicated above, it was conservatively estimated that 25% of the country's water heating load was already covered by "conventional" load management systems.

The proliferation of load management systems to cover the other 75% of the available water heating load would have to be facilitated if the resource was to be accessed in the future.

Conventional hot water load management systems have traditionally been used in such a manner as to effectively manage load during peak periods with little or no regard for customer comfort or centralised scheduling or interruptibility.

The objective of the Flexicon project was to implement a water heating load management system, which would be loosely based on conventional geyser load management systems (radio/ripple). The system proposed would be of a far more "intelligent" and "flexible" nature than the existing systems.

The objective is to maximise the amount of shiftable load during the peak periods whilst still ensuring that customers seldom/never experience cold water.

The main feature of the hot water load control system proposed is FLEXIBILITY. One of the underlying principles of the system was to be that of individual customer choice, particularly in how their hot water cylinder is controlled.

The load management system to be implemented would allow each geyser relay to be addressed individually. In addition, each individual relay's group allocation would be programmable remotely. This means that it would be possible to customise the manner in which each customer's geyser is controlled to cater for the household's lifestyle by setting up a number of differently controlled sets of groups and allowing customers to choose their control strategy to a degree.

Initially, there would be a number of preset control algorithms, possibly four, each with a lesser or greater degree of control. During phase one of the project (during commissioning) households will be allocated to an algorithm based on a short questionnaire filled in during installation of the load switch. The information recorded at the time of installation includes amongst others the geyser temperature, element size, number of people in the household and times at which baths/showers are taken.

In addition a 24 hour manned customer care centre would field customer calls. Based on the customer's complaints they would then be dynamically allocated to different groups (priority and algorithm). The customer is given the choice of changing from their default algorithm to one of a higher or lesser degree of control.
The decision was taken to implement a large scale pilot of such a "Flexicon" system in the Tableview area supplied by Eskom.

At this time, during 1998 it was brought to the project team's attention that network upgrades had been planned for the Tableview area due to sustained, unprecedented load growth during the preceding years. See Figure 5.

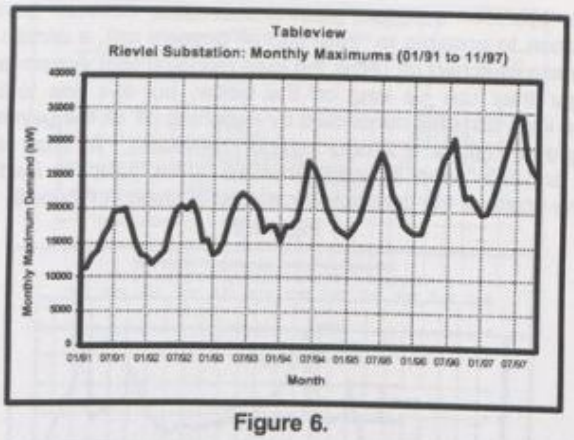


Figure 6.

Shifting of load from the morning and evening peaks would improve the load factor and reduce the magnitude of the peaks. The end result would be more efficient utilisation of the existing reticulation infrastructure. The evening peak of 33MW would hopefully be reduced by 10MW, to around 23MW, almost a 30% reduction.

Traditionally customers have a tendency to view centralised hot water load management systems in a negative light. To counter this perception, a marketing campaign was initiated 2 months prior to the commencement of installations.

The marketing campaign also continued through the installation period. This took the form of education leaflet "knock and drops", exhibitions at major shopping centres in the area, advertisements on billboards and exposure in the local newspapers.

Extensive training of the customer care centre staff was also undertaken to ensure that customers would not be frustrated when calling in with a query.

The implementation of the "Flexicon" load management system commenced during the latter half of 1998 and continued through 1999. The Tableview natural demand profile recorded during a day July 1999 is given in Figure 7.

The shape of the 1999 load profile is similar to that of the 1998 profile, but the winter was less severe which is indicated by the lower evening peak demand recorded. The particular day on which the readings were taken might also have been more moderate in 1999 than in 1998.

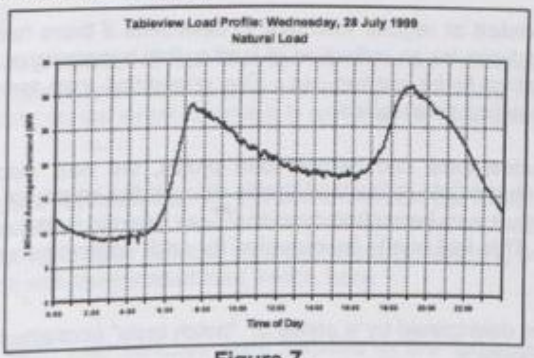
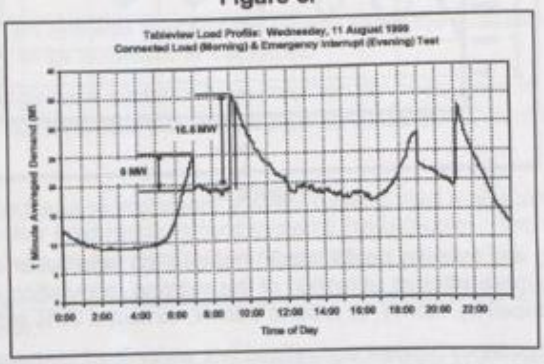


Figure 7.

After establishing the general shape of the load profile, the next step is to determine the Load Management System's connected load. This is the amount of water heating load that would be present in the load profile if all the geysers fitted with load switches were to be on at the same time.

In the normal course of geyser operation a certain amount of diversity between geyser on times exists. To ensure that this diversity factor is as close to possible to zero (i.e. all geysers on), a certain amount of geyser manipulation must be done. All the geysers are switched off using the load management system and are then kept off for a period of 2 hours or more, the longer they can be kept off the better, but this has to be traded off against customer inconvenience. The connected load test was conducted by switching off all the geysers as close to the morning peak as possible and then keeping them off for a 2 hour period (7am-9am). At 9am all the geyser load was returned simultaneously to the system and the "jump" in load recorded. This "jump" in load represents the total connected geyser load on the system. The graph of the connected load test is given in Figure 8.

Figure 8.



The graph shows that when the geysers were switched off at 7am, the diversified geyser load present in the load profile was 6MW. After keeping all the geysers off during the peak period, 16.6MW of water heating load was returned to the system 2 hours later and represents the connected geyser load on the Tableview system. This connected load represents 8500 installed geyser load switches at that date. An additional 1000 switches were installed by the completion of the project.

The connected load per geyser is calculated by dividing the total by the number of geysers and is calculated to be 1.95kW in this case. This is an indication of the average geyser element size in the area. Geyser element sizes can vary from 1.5kW to 3kW or even higher in select cases.

During the installation phase of the project it was noted that a high number of households have geyser timer switches installed, this would affect the connected load test by preventing the geysers from switching on, even when the load management system allows them to. The result would be a slightly lower connected load reading and average geyser element rating than is actually the case.

The connected load test is repeated at regular intervals to determine if there has been any significant change. A significant drop in connected load can be an indication of load switch bypassing or failures which would require some kind of maintenance/audit initiative to be carried out. The connected load test is also repeated each time after expansion of the load switch base has taken place.

Having established the connected load and natural load profile, the next step is to determine the amount of controllable water heating load that exists in the load profile through the course of a day. This information is used to determine the amount of load that can be shifted from the peak periods to the off-peak periods and the amount of demand reduction achievable. This test has to be repeated for each season as water heating load is sensitive to the prevailing weather conditions.

The water heating load profile is determined by a series of "notch tests" (explained above). The notch test conducted on 10 August 1999 is given in Figure 9.

The graph only of one test day, a number of test days were done and the results from them averaged as water heating load is temperature sensitive and can vary significantly from day-to-day. The test on 10 August 1999 was started at 6am and ran until 9:30pm. This was to minimise possible customer inconvenience due to noise caused by the constant switching of relays.

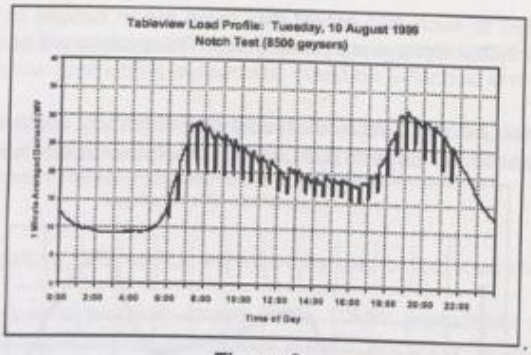


Figure 9.

Other test days were run from midnight to 9pm and also from 6am to midnight to obtain the early morning and late evening load. The graph of the water heating load for 10 August 1999 is given in Figure 10 below. The early morning and late evening measurements from the other test days are included to present a complete picture of the water heating load for the day.

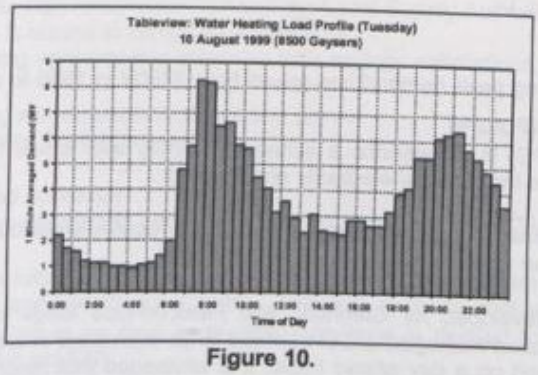


Figure 10.

The water heating load curve shows that the morning peak occurs at 7:30am and is 8.2MW in magnitude, the evening peak occurs at 9pm and is 6.4MW in magnitude. This translates to a diversified figure of 1.02kW per geyser in the morning and 0.8kW in the evening.

This graph represents the MAXIMUM amount of load that can be removed from the load profile at each time interval. However, water heating load is dynamic and if load is removed during a particular time interval it will affect the load in subsequent time intervals depending on the length of time it is removed for and when it is restored and the manner in which it is restored.

The water heating load profile (Figure 10) is used to set the demand limits, but realistically the system is only able to maintain 80% of the maximum available load shift if customer comfort is to be maintained. This means that the morning peak for Tableview can be realistically reduced by 6.5MW and the evening peak by 5MW at the point in time that these readings were taken and with the installed load switch base.

Upon completion of the project, 9850 load switches were installed in the Tableview area. A number of "energy-savings" algorithms have been set up which allows customers to choose (by calling the Eskom Bellville call centre) how their geysers are controlled. Customers can choose to have their geysers switched off during the evenings and afternoons to minimise standing losses as well as being controlled during the peak periods.

In addition, a Residential Time-of-Use (TOU) tariff is being piloted in Tableview and these customers' geysers are switched according to the TOU tariff to ensure that no geyser energy is consumed during the peak periods.

The Tableview area has expanded to such and extent that there are in excess of 6000 new households in the area since the initial 9850 load switch installations were completed. The system will be expanded with an additional 6000 switches by the end of 2001.

There has been a tremendous amount of growth in the Tableview electricity demand. The demand curve in Figure 11 was recorded on one of the coldest winter days in 2001, a day on which a notch test was also conducted.

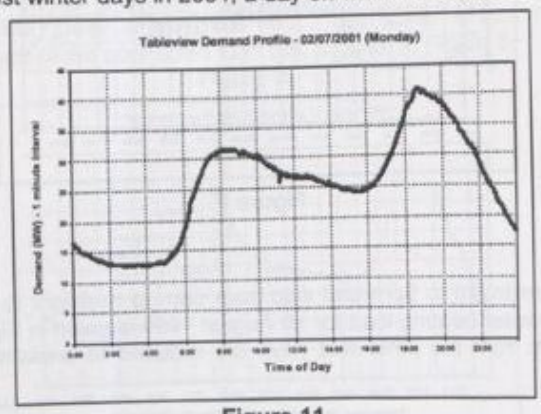


Figure 11.

The graph shows that the evening peak demand has grown from 33MW in 1998 to over 40MW in 2001.

5. The Virtual Power Station (Future)

The Virtual Power Station (VPS) is in essence a scheduling entity with a link to a manageable load (e.g. Load management system) as well as the national electricity grid operator.

The VPS will be used to co-ordinate groups of manageable or interruptible loads that may be too small on their own to trade on a reserve market power pool.

Models are presently being developed for Comricon and Flexicon-type loads to allow realtime evaluation of the benefits of tariff vs. reserve market management of the load to be evaluated in order for a decision to be taken as to where the load should be utilised on a day-ahead basis. It is envisaged that reserve market trading of water heating load or "negawatts" will begin in earnest in the second or third quarter of 2002.

The requirements and conditions for this initiative are still in the process of being finalised and should hopefully be available during the first quarter of 2002.

6. Demand Side Water Heating Rollout 2002

Eskom is in the process of implementing its Demand Side Management (DSM) rollout plan which incorporates a significant proportion of water heating load management.

The DSM rollout plan targets 400MW of new manageable water heating load over the next 10 years, beginning in 2002 with a target of 49MW.

The strategy will be to facilitate the proliferation of new residential water heating load management systems by way of funding at favourable interest rates as well as the provision of assistance and expertise with the implementation thereof.

The rollout of the DSM plan will be by way of Energy Service Companies (Esco's). The Esco's will be required to enter into agreements with local supply authorities for the implementation of load management systems to be funded by Eskom.

A performance contracting agreement would be entered into between the Esco and the Local Supply Authority. The capital funded would then be recovered by way of the performance contracting agreement, based on tariff savings achieved. The operation of the system would be done by the Esco or the Local Supply Authority.

At the end of the contracting period, estimated to be 7 years, the system would become the property of the local supply authority and the performance contracting agreement could be extended and re-negotiated.

It is envisaged that the 49MW load management rollout for 2002 will be taken up by Technology Services International, a division of Eskom Enterprises due to logistical and resource considerations. The DSM targets from 2003 onwards will be available on open tender for any Esco to bid for.

7. The Offer 2002

The 49MW load management target for 2002 will be achieved by way of four load management projects.

One refurbishment/expansion project is planned as are three 10MW greenfields sites. The refurbishment site is currently under negotiation as is one greenfields site. There are still two greenfields sites available and any interested Local Supply Authority is welcome to contact the author for consideration.

The greenfields sites are proposed as "demonstration" sites. This means that there should be substantial potential for further expansion of the sites in subsequent years once the initial base of 16 000 switches representing a conservative 10MW of manageable load is installed.

The rough sequence of events is as follows:

a. An agreement of intent is signed between TSI and the Local Supply Authority (LSA)
b. A request for proposals is issued to prospective suppliers
c. A performance contracting agreement is drawn up with savings estimations, etc.
d. A tender is issued
e. Performance contracting agreement is finalised and signed
f. Load Management System Contract is awarded
g. System Implementation
h. System maintenance and operation
i. Ongoing monthly savings calculation and apportionment with capital repayment (7 years maximum)

Every load management system initiated or implemented under the DSM program is required to link to the Virtual Power Station and a Monitoring and Verification Centre. The cost of these links will be paid for by Eskom's DSM department and will not be required to be paid back unless revenue is derived from the link at some stage (e.g. trading through VPS on the reserve market).

It is imperative that the four prospective projects are committed to by the end of 2001 to ensure that the required funding is secured.

8. Conclusion

A golden opportunity presents itself in the form of the Demand Side rollout plan.

The expertise gained over the past 5 years researching and implementing load management will be put to good use to ensure the expansion of the water heating load management base within the country and stands us in good stead to make a success of this initiative.
Capital can be sourced for the implementation of new systems and refurbishment and expansion of existing systems at financing costs that will still allow projects to be viable.

The repayment of the funding is by way of a performance contracting agreement with and Energy Services Company thereby reducing the risk to the Local Supply Authority. The Esco is required to ensure that the system is viable and is responsible for the repayment of the capital funded.

The establishment of a long-term sustainable load management resource within South Africa is of paramount importance to Eskom's DSM rollout plan and will be supported over a 10 year horizon.

The Local Supply Authority (LSA) is able to acquire a substantial load management system immediately and share in the savings for the duration of the performance contracting agreement whilst outsourcing the maintenance and operations to an Esco (if so desired). At the end of the agreement period, estimated to be a maximum of 7 years, the

LSA acquires ownership of the system and its full benefit then accrues to the LSA. The LSA still has the option of outsourcing the system operation and maintenance at the stage if so desired.

In addition, benefits will accrue to the South African economy, not to mention the environment.

The author's contact details are:

Postal Address: P.O. Box 1091
Johannesburg
2000
Telephone: (011) 800 2625
Facsimile: (011) 800 5970
Email: chris.forlee@eskom.co.za

Research and Development of Lighting Technology for the Continent of Africa

Researched and prepared by John T Grundy CEng of Lighting Sciences Africa (Pty) Ltd.
and
Assisted and presented by Robert Henderson Pr Eng of TSI – A Division of Eskom Enterprises.

Synopsis
Whilst in the Republic of South Africa low cost electricity supplies have enabled installations of modern lighting, there are areas in the countries of the African Continent that are still without electricity and hence no modern lighting. Today, change is the only constant. During the Authors' ongoing activities new and alternate options are continually encountered. If they feel any change will benefit, they have the ability to act speedily; certain examples are quoted.

In view of the misunderstanding of the human eye rods and cones in regard to quoted lamp luminous efficacies the Authors' as briefly as possible endeavour to clarify such relations. Without doubt CIE Technologists will clarify visual performances in the mesopic range devoid of commercial salesmanship in due course. Electronic developments will ensure that there will be many changes in all discharge lamp auxiliaries and control systems.

Interior Lighting

Interior Lighting in future is likely to incorporate much greater usage of natural light, leading to electricity savings of up to 70% by the incorporation of ECO saving technology. Furthermore developments in both reflector materials and window films will ensure greater efficiencies in all interior lighting. Luminaires using such as T5 and Compact Source lamps will result in new designs.

Exterior Lighting

Further developments in road lighting luminaires will ensure peripheral vision and discharge lamp developments are reviewed. In regard to floodlights far more attention will be paid to obtrusive and waste light control.

Ecological effects of man-made lighting in areas where life has been only sunrise to sunset are considered. Mention is made of the obvious changes called for in the Montreal Protocol of 1985, that ever increasing hole in the Antarctic Ozone Layer together with the Kyoto Protocol and further meetings held in 2000 & 2001.

Extensive lighting education is going to be required for all n the African Continent, thus required is a completely independent lighting Advisory Bureau.

1 Introduction

The fact that as we progress through our time allowed to live, the more we do continuously learn is actually to realise the less we do know. A fact so often not seen. The South African National Committee on Illumination (SANCI) and the International Commission on Illumination, known as CIE by reason of its original French title, claim to be generally recognised and accepted as representing the best authorities on the subject of lighting. The CIE discussed in this paper are; Division 3 "Interior Environment and Lighting Design", Division 4 "Lighting for signaling and transport" and Division 5 "Exterior and security lighting

2 Definitions

The Authors' bring to notice the repeatedly ignored CIE two definitions of Light: -
Any radiation capable/ suitable of causing a visual sensation directly.
Radiation capable of stimulating the organ of vision.

$$L_v = K_{m\,360}\int^{830} L_{e,\lambda}\, V(\lambda)\, d\lambda$$

Where L_v = Luminance in cd m^{-2}
$L_{e,\lambda}$ = Spectral radiance in $wm^{-2}\, sr^{-1}\, nm^{-1}$
$V(\lambda)$ = spectral luminous efficiency for photopic vision
Km = maximum spectral luminous efficacy (683 lumens per watt)

Light is radiant power **weighted** according to the spectral sensitivity of the human eye [1]. This dependence on the sensitivity of human vision is also repeatedly not clearly understood. The human eye, being an extension of the human brain, has circa 125 million rods and 7 million cones, so named since they have slight similarities to those shapes. The cones are concentrated for the most part at the fovea and perceive the finest detail and colour. Rod (or parafoveal) vision does not discriminate fine detail [1] CIE Division 1 "Vision & Colour" and Division 8 "Image Technology" in effect deal with both Vision and Colour extensively. Thus appears the expression Photopic (Cone and Daylight Vision), Scotopic (Rod and Night Vision), as well as the Mesopic border region between them which is about 2 candelas per square metre, often road lighting illuminance levels. The CIE provide what are known as Spectral luminous efficiency curves, Scotopic and Photopic, but there has yet to appear a recommended data system for the mesopic range. Which may of course eventually appear from CIE Division 2 "Physical Measurement of Light and Radiation". Whilst a system of CIE Photopic Photometry has been in existence for over 70 years and a System of CIE Scotopic Photometry for over 40 years, the missing Mesopic Range causes vast confusion as regards luminous efficacies; so called Lumens per watt for discharge lamp light sources could differ by 50% as compared with the relative efficacies on the photopic scale. Furthermore what is known as the CIE Photopic (V-lambda) data, originating in 1924, seriously underestimates human eye sensitivity at short wavelengths. One expert (Judd) proposed a revised V-lambda curve in which values at wavelengths shorter then 460nm were considerably increased. In 1978 another expert (Vos) completed Judd's work. Thus there appears on occasions as 2° photometry, 10° photometry data.

3 The Eye

There being three types of cone receptors in the human eye, results in what is known as the CIE Tri-stimulus values, used for CIE Colour Specifications and Colour Matching functions, XYZ; as well as the rod receptors. The CIE system of photopic photometry is derived from what is known as flicker photometry. Flicker cannot be used to establish a scale in the mesopic region because of discontinuities and ambiguities in the visual response data. However, such items as D65 Daylight, (as well as others) do exist for spectrophotometry as well as fluorescent materials and colour matching, which brings to notice Colour Rendering Indices (Ra), Illuminances (lux) and Unified Glare Ratios (UGR) for Interior Lighting.

4 Codes, Standards, Specifications, Normative & Informative.

Such are compiled also by those who claim to be generally recognised and accepted as representing the best Authority, in the instance of this paper on the subject of Lighting. Such also for many other purposes, do form themselves into such bodies as Government and quasi-governmental organisations. Thus we have such as ANSI (USA), AS/NZS (Australia and New Zealand), BSI (UK) ISO (International) and SABS (RSA). The medieval Guilds imposed strict specifications and quality controls on their members. Safety and Health of the State, in addition to

protect their military safety, governments have developed Standards and Regulations to protect their economic health.

5 Publications

The Americans, with the Canadians, are active with the latest edition of their ninth issue this year 2000 "IESNA Lighting Handbook Reference & Application" which includes a very important new section 'Quality of the visual environment (Lighting Quality Design Guide). This completely new section explains a formal system considering a wide range of Lighting design criteria aiming at guaranteeing Lighting Quality.
Above all, completely lost amongst all the American, Australian, British, Canadian, European Union year 2001 new Codes is CIE DS008 3/E "Lighting of Indoor Workplaces" which seems to have been started by CIE TC 321 of Division 3, which started its life in 1995 possibly being a revision of ISO8995:1989. Listed in that publication are circa 300 different work activities for which are specified illuminances, Universal Glare Ratings and Colour Qualities.

6 Natural Light

Way back in July 1995 Dr. Warren Julian asked "Will Daylight emerge from the darkness?"[2] The reason for the question was that nobody in lighting design seemed to pay much attention to including Daylight! Well, Lighting Research & Technology Vol.32 No. 3 late year 2000 provided a mass of data and the Authors' list such in the Reference.[3,4] Further still in Lighting Research & Technology Vol. 32 No. 4 year 2000 [4]. Quoting from the authors' Reference [4] the human answer is, after sixteen buildings and 270 occupants were surveyed and questioned "... Few felt they had too much daylight. ... but likely to be dissatisfied ... when the daylight factor was over 5% ...". Daylight gives a building a unique variety and interest according to British Standards on Daylighting, BS 8206 Part 2.

Actually the BS Code 8206 Part 2 recommends that 'if electric lighting is not normally to be used during daytime, the average Daylight Factor should not be less than 5%. If electric lighting is to be used throughout daytime, the average Daylight Factor should not be less than 2%. Anyone can find these Recommendations in CIBSE Daylighting & Window Design [5] and the CIBSE Code for Interior Lighting [6].

Overall the Authors' are inclined to ask if anyone involved in lighting realises that the sun is said to rise in the east and set in the west. Such not considered in any way, it is customary to place a building parallel and/or facing any road, the direction of which has been designed by some Road Construction Engineer for totally different reasons than the requirement to orient a building to enjoy the best advantage of all possible Daylight! All buildings in the RSA of course are supposed to comply with SABS 0400 1990 Code of Practice of the National Building Regulations. SABS makes reference to SABS 0137 Code of Practice of the installation of Glazing materials in buildings. The definition of safety glazing is covered by SABS 1263-1.

7 Man made artificial interior lighting

Most people today assume that artificial lighting commenced with the electricity industry which was a lighting successor to the Gas Industry and further back still to Tallow and Wax. 'Artificial' Interior Lighting, the Authors' point out commenced circa 500 AD. Lighting was so much of Christian Church Life that we are told that one-third of Church Revenues were allocated to lighting and repairs. Coronea, the classic circular chandeliers still familiar in churches today were being used and from such the 12 turreted Romaneso wheel designs being developed. By the eighth century enormous cross-shaped chandeliers in St. Peter's in Rome used 1365 candles. Crystal Chandeliers were highly popular towards the end of the 17th century and the Authors' provide some illustration and details.

Today of course the developed countries all have their Lighting Societies. In the RSA 1953 saw the establishment of SANCI. A Branch of the British Illumination Engineering Society (IES) had existed for many years. Certainly we've all gone through the filament lamps lighting, the mercury vapour and low/high pressure sodium lighting, the linear fluorescent and we are now being bombarded with the Compact Source Fluorescent.

8 Installations

The Authors' assume that in regard to the design of interior lighting installations, the basic principles are known. The lamps and the luminaires, the calculation methods involving the familiar 'lumen method'. The avoidance of glare, conscious attention to colour, form, texture, variety together with the combined effects of light from natural and electric sources.

8.1 Industrial Lighting.

Combined natural and man made artificial lighting is not new. In the early years of the 1900s, it was necessary to have facilities for daytime working in which side windows and roof lighting were provided, as well as noting the crude

electric interior lighting luminaires with filament lamps. In the UK it was the 1914-18 war which resulted in ladies entering the industrial workplaces. The early 1930s saw the entry of the first 400 Watt uncorrected mercury vapour lamps, today the circular and linear colour corrected types. Followed by the linear so-called five foot fluorescent tube installations commenced during the Second World War 1939-45. With increasing lamp lumen efficacies the obvious complaints of glare arose, thus in particular the introduction of Glare Indices. Improvements in industrial luminaires were the results of all the extensive work on reducing glare overall. In cleaner situations the overall illuminating ceilings appeared, whereupon it became necessary to devise calculations and limits to the overall illuminances. Thus today we do have recommended illuminance levels for the many varieties of tasks. Much to be said for combined natural and electric lighting and we forecast the dimming and electronics of all the discharge lamps, making for more economies in costs of lighting.

8.2 Commercial and Office Lighting.

Certainly commercial offices lighting since the late 1940s has been dominated by the fluorescent tubular lamp. The early UK installations used the 5 foot 80 Watt lamp, and the illustration the Authors' show is what you do not see when you go to the Royal Navy famous 'Gieves the Tailors" in the 1940s. The control gear of 80 Watt Mercury Vapour Choke, being Cubic had to be housed in an external box. Uplighters are not something new, in the 1940s Lloyds Bank used such, the luminaire housing the colour corrected mercury vapour lamps. Banks do not change much in their lighting tastes, thus the Authors' illustrate a 1990 National Westminster Bank installation, again colour corrected mercury vapour sources.

8.3 ECO systems

The British and certain of the European Interior Lighting Codes today require that an installation has to provide the recommended illuminance levels AFTER a defined period of time (the maintenance cycle). Consequently during this maintenance cycle the illuminance level will always be higher, wasting energy; over the time there is lamp lumen depreciation, the build up of dirt on the luminaires and all the room surfaces. Today, at least twelve of the European lighting manufacturers recommend and install ECO Systems. Such are daylight linked. The actual illuminances are set at the outset using high frequency regulating fluorescent lamp ballasts, operated from the mains supply, but also having a two-wired voltage control system. As the variable daylight increases or decreases, so the light output of the fluorescent lamps are also varied, ensuring that the maintained illuminances remain at the correct levels. Claimed are energy savings of up to 70% together with increased lamp lives.

Commercial and Office Lighting over the past 30/40 years in the opinion of the Authors has been the subject of far more Papers, far more Conferences, vast varieties of chaotic concoctions of cacophony – in short, more controversy than any other branch of lighting engineering. Whilst television watching never had any problems Black, White and/or Coloured, the introductions of what were originally called Visual Display Units (VDUs) altered to Visual Display Terminals (VDTs) in offices resulted as a commencement the outcry in regard to radiations from the screen, which in due course had extra glasses, anti-radiation devices, multiple concerns in regard to pregnancies and/or prevention of pregnancies and/or abortions. The CIBSE produced in 1982 TM6: Lighting for Visual Display Units. As speedily as was possible CIBSE Lighting Guide LG3 Areas for Visual Display Terminals 1996 actually. The British Government published much on VDU Regulations "...aching hands, arms, necks, fatigue...et al" "Upper Limb Disorders or stress...". "The Health & Safety Display Screen Equipment Regulations...set out the steps to take to reduce the risk" said they. Naturally, all the European Labour Unions were continuously active, thus not only had the Lighting Engineer to know his technology, he needed to know every law that existed as well as ensuring the luminaires he used had the Lighting Industry Federation Certification. The British stattoday they are publishing an addendum to CIBSE Lighting Guide to avoid dull lighting of interiors.

All fully qualified Lighting Engineers do know how to determine the working plane illuminance and the correct Glare Indices, as well as the calculation of the luminances of the walls, ceilings and floors. In addition, he certainly has established that the modelling of the features of the occupants are acceptable to each other. Since the Americans and Canadians are proceeding with further efforts to ensure Quality in Lighting, whilst the RSA today does not do any interior lighting research, the Authors' bring to notice a CSP system. [31]. CSP means Visual Comfort (absence of Glare), Visual Satisfaction (relative illuminance of vertical and horizontal surfaces) and Visual Performance (lighting conditions at the task). Pages 340 – 2 of the Reference [7] provides an example of an installation assuming 100% usage of VDTs.

Is it ever possible in the RSA that buyers will consider the Lifetime Costs instead of the Initial Costs of the Lighting/Luminaires they buy? Therefore it is here that the Authors' illustrate such as Dealers Rooms, and particularly refer to the lighting requirements needed in Aircraft Control Units. Here the Authors' do hand it to the Canadians. Whilst South Africans may not ever fly across the Atlantic, Gander Oceanic Air Traffic Control Centre in Newfoundland each year handles 260 000 aircraft, in summer 800 per day, slightly fewer in the winter. Ironically, for the Authors' the ARC Rooms at Gander are windowless. Why? Early radar required almost complete darkness for operators to see the screens clearly. Modern Radar Screens are brighter and clearer but the windowless tradition of the 1930s when Newfoundland was a British Colony has just continued.

9 Entertainment, Hotel, Leisure & Ships Lighting Progress abounds

9.1 Stage, Studio, Television Lighting.

CIE Division 3 does have a Reporter on Stage & Studio Lighting, Mr. K.R. Ackerman. Prior to his retirement he was the BBC Television Lighting Engineer, with considerable experience in Colour. Every four years a conference entitled SHOWLIGHT takes place, at which the whole entertainment lighting industry display their latest wares and technologies. Whilst CIE Division 3 ignored the 2001 function, no doubt in the near future there will appear much detail of Papers and new electronic equipment.

9.2 Hotel Lighting

Overall, in the RSA the lighting of Hotels is simply fast track installations involving much plastic low cost equipment. Therefore the Authors' bring to notice the commercial success of Dubai. A ten year project resulted in the creation of the world's leading resort hotels, the Jumeirah Beach Hotel and the Burj Al Arab Hotel. The first was designed in the shape of a giant sail. All completed to British Standards specifications. Opulence and luxurious accommodation price is £700 Sterling per night. 8 000 channels of lighting controls were designed and manufactured.

9.3 Leisure Lighting

In the RSA, the Authors' simply bring to notice the various fast track lighting installations in the various new Casinos, seemingly illuminated regardless of the use of much electricity. Which may be compared with Trumps Casino in the USA or the Australian Sydney efforts.

9.4 Ships Lighting

In their Einhorn Memorial Lecture [8], the Authors drew attention to the fact that Professor Einhorn's career commenced in Germany as a Ships Engineer. Which may or may not have led him to arrange the extensive floodlighting of Table Mountain. The Authors make mention of the large number of ships being built for holiday cruising in various parts of the world and for many different Nationalities. What is remarkable is the involvement of interior designers and lighting designers. The developments of the interior and exterior lighting of the ships provide facilities ranging from the ice cream stall to the first class banqueting as well as all the suspect joys of gambling. To which of course are added the ship's own shopping centres illuminated far more extensively and better than most of the shops and supermarkets ashore. Developed from the early Church Chandeliers, today using gold and silver plating as well as 30% lead incorporated glassware.

9.5 Shops & Retail Store lighting

Whilst making passing reference to a SANCI Paper "Lighting for the Retail Market" presented by Grundy & Yates in 1997 [9] '...lighting should attract customers to a shop and encourage them to enter...' such is most definitely being done today by such famous shopping stores as Marks & Spencers, Boots, Sainbury et al. Daylight is most certainly being incorporated and harmonised completely with the man made electric lighting equipment. It is of the utmost importance to encourage greatly the customer to actually enter the store, regardless of no intention to purchase any item of any sort.

9.6 Home Lighting

Home lighting is where the user is in their castle and much is to their own taste. Unfortunately many home owners rely on the advice given by the contractors which is given more on a profit and sale rather than on the better use of both natural or artificial lighting systems. The initial cost is all that is considered in most installations and not the life costs. The use of little spot lights in ceilings of all rooms are presently encouraged however many of these sources provide very little useful light and certainly not efficiently. The high cost of electricity is driving more users to install the compact fluorescent lamps in their homes.[34] Their use has increased due to the lowering in the initial price, the reduction in physical size and that they are available in retail outlets. There has been an education drive to promote these lamps and with this is the drive to conserve our resources of coal and water. The low cost housing projects

have their Architects, Builders and contractors approached to install the modular compact fluorescent lamps with separate control gear in dedicated fluorescent luminaires and so the user must maintain the lamp as an energy efficient system. The use of tubular and CFL are not recommended in all luminaires in the home as many do not operate long enough to justify the cost with the energy saving. The rule of thumb used is that only lamps burning longer than three hours should be considered. The use of daylight in homes is increasing with the use of light tubes and in South Africa the middle and upper income homes have large glazed areas allowing natural light to enter. This has been designed by the architect rather than the lighting engineer, but it is in the opinion of the authors that no calculations or optimisation of this light has been done. The savings in lighting load may be small and completely lost due to the increased heat loss or gain from these glazed areas.[5]

10. Exterior Lighting

CIE Division 4 and 5 are responsible for much development. There are available wide ranges of High Intensity Discharge Lamps, often not used in Interior Lighting.

10.1 Light Source s

Over the past seventy years the lamp industries have developed such as mercury vapour tubular and elliptical shaped light sources, to add to these today we have the metal halide lamps. Whilst based on mercury vapour, the additions of various halides have not only produced more extensive and better colours appearances and renderings, they also now introduce such saturated colours as green, blue and red. In the sodium vapour fields, there have been and still available all the so called highest efficacy low pressure sodium ranges, followed by the high pressure sodium types, higher efficacies as well as better colour renderings and appearances. Again the lamps are available in tubular as well as elliptical forms. Whilst the fluorescent tubular lamps were for a period of one time used in large lanterns, today we have the new ranges of Compact Source Fluorescent lamp types, which can be well used for not only domestic and commercial lighting, but also can be used for streetlighting, as well as decorative types of floodlighting and security lighting.

10.2 Streets & Roads Lighting

Such gain we can well divide up into particular sections, since luminaires are available for several aspects of our cities and towns. Lanterns are on the market incorporating not only one particular lamp, but also can be obtained carrying twin and triple lamps in each lantern, thus enabling single and three phase lighting, which by simple switching can be increased dependent on the times desired. Trials are already being carried out whereby dimmer systems are being tried out overseas.

10.3 Vehicular Traffic Routes

Considering first the both Free and Tolled Motorways, considering the Toll Plaza, originally it was necessary to graduate the lighting for the drivers having to reduce their speeds, on entering from an unlit area and having to make eye adjustments on departing into unlit areas. In the future, we will be lighting the Toll Plaza where the vehicle just go through at a stated speed without stopping at all. Wider still and wider will these Toll Plaza's become by reason of increased road traffic. Not only High Mast 30/40M lighting, but lower heights such as 17/18M mounting heights in such as Tongaat Toll Plaza and Midrand new interchange. Considering such as extensions from two to four lanes, for such as the N1 Ben Schoeman Highway, whilst the emphasis has been on road surface lighting, no wasted upward light whatsoever. Developments have been in increasing the 100% downward only strictly controlled light output ratios from originally 60% to up to nearly 80% today, and some data on the necessary tests are an Appendix herewith, carried out by TSI, a Division of Eskom Enterprises.

For all the vehicular traffic in the Cities & Towns, CIE Publication No. 115:1995 "Recommendations for the lighting of roads for motor and pedestrian traffic" is still the basic foundation for good lighting, despite the amendments made for commercial and ethnic reasons in various countries. Furthermore, the Authors' particularly make reference to the Dr. Rea's 2000/2001 comments '... "current roadway lighting in Britain and North America do not ... address the illumination of areas adjacent to the roadway ... new research on roadway lighting should inform Standards, but Standards can become barriers to new ideas ..." The Authors' have informed Dr. Rea that certain Luminaires designed in the RSA do meet his iconoclastic requirements. (10). Certainly in the developed and developing countries of the world today, such as France, Germany, The Netherlands, Japan, UK & USA the old traditional tear-drop plastic bowl lanterns have all been replaced by modern flat or slightly curved glass and plastic enclosures, except where historical harmonising with architecture lanterns are specified; or initial lowest tender prices such as Johannesburg City practices are mainly the criterion, as distinct from 25 – 40 years service in site products.

The modern developed road lighting luminaire optical arrays can also be used in applicable interior lighting installation, such as supermarkets, industries and town and city centres, requiring rescue from deterioration.

10.4 City, Town Centres & Shopping Malls
The lighting world does provide an extraordinary series of ranges of luminaires of the ages. Citizens of such as Chicago, Dublin, Edinburgh, London, Paris, Rome, Singapore, Tokyo, all do take great pride in their cities and homes. Possibly the most remarkable has been Singapore, from third world to first in the lifetime of one man alone. It is well known that city centres do have decay periods, but with the efforts of many, rehabilitation does happen. To meet such, the lighting designers and the industry will and can provide the particularly required luminaires and lighting. Paying particular attention to the requirements if the pedestrians.

10.5 Pedestrian areas
Recommended and complete data available are recommendations for what is sometimes called Semi-Cylindrical system, but pedestrian, residential areas lighting can be provided with recommendations as normal illuminant levels. The styles and colour of the lighting is available to particular selection. Possibly of some importance, individual house/ residence security lighting luminaires can be supplied, fitted by present day recommendations economic long life, high efficacy compact source fluorescent lamps. The same can well be said of the particular Townships, some with the original high technology high masts lighting introduced to both high lighting technologists as well as the poverty-stricken resident by Percy Giles Pr. Eng. Of East London, President of the AMEU 1962-3. With regret, the Author's report that the majority of Residential Areas lightings are only scaled down versions of vehicular traffic roads lighting.

10.6. Floodlighting
Again, vast varieties of luminaires are available for lighting everything from individual buildings to sport stadia.

10.6.1. Buildings Old & New, Private & Public
Possibly the most neglected today, the Churches of all denominations. To celebrate the Millenium, regardless of the political Dome in London, the Lighting Industry Federation joined in a co-operative effort to floodlight 500 Churches in the U.K. Grants and technologists resulted in a completely successful operation. No church was over or under lit, no contributed funds were wasted since every project had a lighting engineer provided and approving a lighting scheme before any grant was allocated. Here in the RSA at one time such as Johannesburg City Library, Art Gallery and other buildings were floodlit. Not only for security reasons were commercial buildings floodlit, they were publicity projects.

10.6.2. Harbours and Docks
Such being working areas at night, since ships riding afloat idle are costing funds. In the past years, such as High Masts installations have been in Cape Town, Durban, Port Elizabeth and East London. All that technology, continually updated is open to new Enquirer and developments.

10.6.3. Airports
Again, every form of lighting from Approach to Runaway lighting for the actual landing aircraft to well controlled area high masts, Aprons, Passenger areas have been developed and designed. Today, tonight, at all hours, aircraft are enroute from country to country and airlines 1st class accommodation has up to date fibre optic lighting systems presenting decorative patterns to their passengers in preference to man made film shows.

10.6.4. Railway Marshalling Yards
In the past years well over 80 what were SAR Railway Marshalling Yards worked over nights using the same floodlights that were used for floodlighting certain Townships.

10.6.5. Parks
At one time, many Johannesburg parks had varieties of clear and coloured floodlighting of trees and bushes, as well as the strolling pedestrian walks. Why such should be tonight neglected is an open question to us all?

10.6.6. Sports Stadia & Entertainment
For those who do prefer to stay at home in front of a television screen, the excellent results and detailed results that viewer can witness can be provided by the first class lighting of the vast area of cricketers, botballers, runners and

other athletical personnel. Thus recorded by those cameramen, by lighted technology in the studios, such memories may be reconstructed and possibly corrected. Was that Batsman OUT?

11. Our World environment

We certainly all are fully responsible. We all have been repeatedly informed, by repeated IPCC meetings- the Intergovernmental Panel on Climate Change Meetings. Montral, Kyoto Protocols, Shanghai, Rio, so many. Since the overall situation has been getting worse instead of any better, 178 IPCC countries did hold recently a meeting in Bonn. At this, they agreed to revisions of the Kyoto Protocol of control and reduction of emissions of greenhouse gases.

This was based on the somewhat contentious concession that certain of the countries, particularly the USA, contained Carbon Sinks. Carbon Sinks are areas where trees and plants are growing rapidly - when that ceases, the Carbon Sink of course largely disappears, and the absorbing levels of CO_2 drop greatly. Planting more trees is not the complete answer, since trees do not emit other greenhouse gases such as methane. Whilst the original ambition of 5.2% reduction in global emissions greenhouse gases by2012 will not be met, we certainly should not be forecasting biological and other forms of terrorism, dead rivers, butchered forests and mighty cities teaming with displaced ignorant peasants or even PhDs from everywhere. How many in South Africa know that in South Africa Shell International Renewables is marketing home solar systems to 50 000 people who live far away from the electricity power grid? Such to the best of the Author's knowledge is about the largest commercial rural electrification project anywhere based on solar power.

So many men (and women) with ideas. The Continent of Africa does suffer from unreliable and diverse rainfall patterns. Australians, for example, have all been brought up to experience periodic water shortages and usage restrictions in their major cities. Increasing populations in all cities do place strains on existing reservoirs and sanitation infrastructure, leading to population problems.
Primarily a sanitation system must provide the means for the safe collection and removal of a given load of human waste. Water based sanitation systems are substantial consumers of water. In fact the humble WC in any home accounts for about a third of in-house water consumption. Thus the Australians developed the 6/3 litres (dual flush water closet system (//). By which between the years 1995 -2050, the annual WC expenditure by Australian domestic consumers would be reduced 1995 AusD370 to AusD278, 2050 Aus838 down to AusD276. Having the new system, over all the Pay-back period would be merely seven years. Which possibly might give Bonesa some publicity ideas for Compact Source lamps lighting? Since one Author is an ex-sailor, ships running out of water have been experienced, which ensures that water is an obsessional matter. Thus this brings us to the ecological impacts of man-made lighting in Africa.

11.1. Ecological Effects

Such of course is experiences by all Plants. Day length has an effect on flowering, leaf fall, seed germinating. Short Day Plants, Long Day Plants. Thus as commercial enterprising, certain of the lamp makers do provide the end users considerable data on plant irradiation. Birds, day length affects the courtship mating rituals, reproductive cycle, migrations et al. Certainly the attraction of birds to light is well documented. Nocturnal birds most certainly are affected by man-made lighting. Mammals, the nocturnal varieties are certainly going to be affected. Insects, so many entomologists have made so many studies that available information is vast.

Thus the Authors are saying that expanding electricity and lighting into Africa will have many unusual effects, possibly not yet forecasted.

11.2. Environmental Law in Africa

The Authors in searching for comprehensive information simply give two References. "Status 7 Trends, Author Bondi D Ogella, published in international Business Lawyer October 1995. Also in that Journal Norman Brauteseth "Environmental Law in South Africa." [13,14]

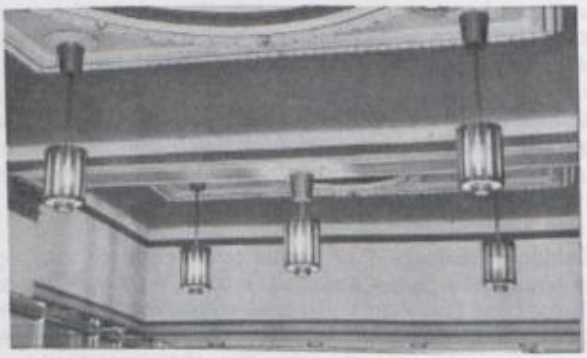
Certainly in the present overall situations, the Authors of this paper for the AMEU 2001 do have doubts whether environmental matters will receive the integrated attention that was given by the Colonial Powers, that once did exist in Africa.

12.0. Conclusions

In presenting some details of their Lighting World, the Authors have noted the 1915 to 2001 life of the Association of Municipal Electricity Undertakings (Southern Africa), by so doing, they were privileged to see the Ghosts of so many, such as Mr. P.A. Scotty Lees of Benoni, Mr. Ronald Simpson of Durban, Mr. P.A. Giles of East London, Mr. J.C. Downy of Springs, Mr. A.R. Sibson of Bulawayo, Mr. J.E. Mitchell of Harare. They trust that similar privileges will be granted to their AMEU audience this October 2001. Their Energy Policies for the future rest on valuable foundations, such being, the Authors wish the AMEU and its member all well for the future.

13 References

1. ANON. Light as a true visual quality CKE Pub. No. 41. CIE Central Bureau Vienna
2. Julian W. Will daylight emerge from the darkness. Lighting, Sydney Australia. July 1998
3. ANON. Lighting Research & Technology. Arnold Journals Letchworth UK
4. ANON. Lighting Research & Technology. Arnold Journals Letchworth UK
5. ANON. CIBSE Daylighting & Window Design. CIBSE London UK
6. ANON. Recommendations for Interior Lighting CIBSE London UK
7. Simons RH, Bean AR Lighting Engineering Applied Calculations. Butterworth-Heinemann Oxfrd UK
8. Grundy JT, Henderson RJ. The time we have. SANCI Proceedings 1997
9. Grundy JT, Yates RS. Lighting for the Retail Market. SANCI Proceedings 1997
10. Rea M. The Road not taken. Lighting Journal Rugby UK. Jan/Feb '01
11. Cummings SJ, Wright GB, Bonollo E. Australian Water Closer developments and their role in sanitation. Building Services Engineering Research & Technology CIBSE London UK Vol. 22 No. 2 2001
12. Hamel G. Leading the Revolution. Harvard Business School Boston Mass. USA p182
13. Brauteseth N. Environmental Law in South Africa. International Business Lawyer. International Bar Association London UK p409
14. Ogolla BD. Environmental Law in Africa. Status & Trends. International Business Lawyer International Bar Association. London UK p412.



Tongaat Toll Plaza note no upward light. & Westminster Bank Edinbrough with metal halide lamps

Fibre optic lighting in a jewellery display. & BP control room using fibre optic lighting.

Daylight in shops - Sainesbury.

WIND ENERGY PROJECT

By Ian Smit, David vd Westhuizen, Neville Smith, Eskom Enterprises, TSI, Private Bag 40175, Cleveland, 2022, South Africa

1. INTRODUCTION

Over the past 20 years, the wind energy market has experienced enormous growth with roughly 15 GW of plant capacity now installed world-wide. Commercial wind farms are now far more competitive, with some European wind farms now operating independently of Government grants and subsidies. International pressure to become more environmentally focussed, specifically with regard to global warming and the reduction of greenhouse gases has been the key motivator in launching the South African project.

The South Afican wind project, being run under the auspices of the South African Bulk Renewable Energy – Generation (SABRE-Gen) programme, a programme initiated by Eskom Research, focuses on understanding the implications of using wind energy on a large scale in a South African environment.

The proposal for the construction on Eskom's first Demonstration Wind Farm is currently being put forward for approval. Two potential sites in the Western Cape have been identified and wide-ranging research is being undertaken to determine the most viable position.

The main objectives of the demonstration facility is to understand the application of wind turbines in the South African context fully, educate the public and other interested parties on wind energy and to provide an opportunity for technology transfer, training and practical experience for the industry and potential wind energy supporting industries and organisations.

An Environmental Impact Assessment has also been commissioned to investigate the impact of the project on the environment. Public participation meetings were completed in March and a scoping report is currently available for comment. Other independent studies include the impact of the project on conservation, especially bird life in the area, as well as on the possible noise and aesthetic factors.

2. WIND TURBINES

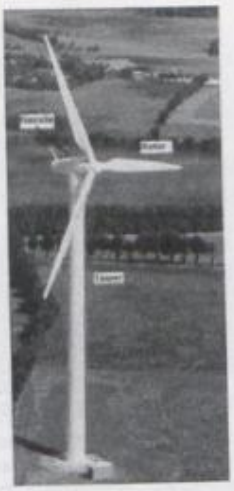


Figure 1.

Nacelle and Rotor

The nacelle (meaning little boat in French), contains the key components of the wind turbine, including the gearbox, and the electrical generator (see figure 1 above).

Service personnel may enter the nacelle from the tower of the turbine. To the right of the nacelle we have the wind turbine rotor, i.e. the rotor blades and the hub. The rotor blades capture the wind and transfer its power to the rotor hub. On a modern 1 MW wind turbine each rotor blade measures about 20 to 30 metres in length and is designed much like a wing of an aeroplane.

The hub of the rotor is attached to the low speed shaft of the wind turbine. The low speed shaft of the wind turbine connects the rotor hub to the gearbox. On a modern 1 MW wind turbine the rotor rotates relatively slowly, about 19 to 30 revolutions per minute (RPM).

Figure 2.

Gearbox

The gearbox has the low speed shaft to the left. It makes the high-speed shaft to the right turn pproximately 50 times faster than the low speed shaft. The high-speed shaft rotates at approximately 1,500 revolutions per minute (RPM) and drives the electrical generator. It is equipped with an emergency mechanical disc brake. The mechanical brake is used in case of failure of the aerodynamic brake, or when the turbine is being serviced. But why use a gearbox? If we used an ordinary generator, directly connected to a 50 Hz AC (alternating current) three phase grid with two, four, or six poles, we would have to have an extremely high speed turbine with rotational speeds between 1000 and 3000 revolutions per minute (rpm). With a 40-metre rotor diameter that would imply a tip speed of the rotor of far more than twice the speed of sound, so we might as well forget it. Another possibility would be to build a slow-moving AC generator with many poles. But if you wanted to connect the generator directly to the grid, you would end up with a 200-pole generator which is costly and impractical. Another problem is, that the mass of the rotor of the generator has

to be roughly proportional to the amount of torque (moment, or turning force) available. So a directly driven multiple-pole generator will be very heavy.

The picture above shows a 1.5 MW gearbox for a wind turbine. This particular gearbox is somewhat unusual, since it has flanges for two generators on the high-speed side (to the right). The gadgets just below the generator attachments to the right (see figure 2 above) are the hydraulically operated emergency disc brakes.

Figure 3.

Generator

The electrical generator is usually a so-called induction generator or asynchronous generator (see figure 3 above). On a modern wind turbine the electric power is usually between 1 and 1.5 MW. The wind turbine generator converts mechanical energy to electrical energy. Wind turbine generators are a bit unusual, compared to other generating units you ordinarily find attached to the electrical grid. The main reason is that the generator has to work with a power source (the wind turbine rotor) which supplies very fluctuating torque to the generator. In order to maintain a constant frequency the wind generators are specially designed to cope with much higher slip vaues of up to 10% compared to the 1% of normal induction machines.

On large wind turbines the voltage generated by the turbine is usually 690 V three-phase alternating current (AC). This voltage is subsequently stepped up through a transformer next to the wind turbine (or inside the tower) to raise the voltage to somewhere between 11kV and 33kV, depending on the local standard.

Wind turbines may be designed with either synchronous or asynchronous generators, and with various forms of direct or indirect grid connection. Indirect grid connection means that the generator is connected to the grid through a power electronic converter to match the grid frequency. State of the art technology currently is looking at large permanent magnet synchronous generators with no gearbox connected to the grid by a matching converter. The varying generated frequency (varying speed of rotation) is rectified and inverted again to match the grid.

Controller

An electronic controller in the nacelle contains a computer that continuously monitors the condition of the wind turbine and controls the yaw mechanism. In case of any malfunction, (e.g. overheating of the gearbox or the generator), it automatically stops the wind turbine and calls the turbine operator's computer via a telephone modem link.

Tower

The tower of the wind turbine carries the nacelle and the rotor. Generally, it is an advantage to have a high tower, since wind speeds increase farther away from the ground. A typical modern 1MW turbine will have a tower of 40 to 60 metres high (The height of a 13-20 story building). Towers may be either tubular towers (such as the one in the picture) or lattice towers. Tubular towers are safer for the personnel that have to maintain the turbines, as they may use an inside ladder to get to the top of the turbine. The advantage of lattice towers is primarily that they are cheaper.

Figure 4.

Yaw

The yaw mechanism uses electrical motors to turn the nacelle with the rotor against the wind similar to the turret on a tank (see figure 4 above). The yaw mechanism is operated by the electronic controller that senses the wind direction using the wind vane mounted on top of the nacelle. The anemometer and the wind wane are used to measure the speed and the direction of the wind.

Wind Speed Measurement

The electronic signals from the anemometer are used by the wind turbine's electronic controller to start the wind turbine when the wind speed reaches approximately 5 metres per second (10 knots). The computer stops the wind turbine automatically if the wind speed exceeds 25 metres per seconds (50 knots) in order to protect the turbine and its surroundings. The wind vane signals are used by the wind turbine's electronic controller to turn the wind turbine against the wind, using the yaw mechanism.

3. WIND RESOURCE

The wind atlas of South Africa currently being completed by Eskom, DME and CSIR highlights the areas of suitability for a wind farm. It is evident, from the results of the modelling of mean wind speeds in the country, that South Africa is not an ideal location for large scale application of wind energy. The commercial viability of a wind generator is widely excepted in Europe as being around 8m/s at hub height. South Africa can be considered as having a moderate resource compared to the wind resource on the west coasts of Europe or South America and New Zealand.

Certainly, there are areas where the wind speeds are in excess of 10m/s but this is not constant and will not benefit annual production or GWhrs in the long run. Land availability and accessibility of grid infrastructure will be the limiting factor in the wide spread construction of wind farms.

South Africa's coastal regions east and west has a resource of approximately 4 to 5 m/s at a height of 10m. Wind speed increases with height above ground and at a typical hub height of 50m with no obstruction (roughness) this would increase to 6 to 8m/s. This figure gives the mean wind speed per annum and is indicative of the average generation at a wind farm. Energy in the wind varies with the cube of the speed meaning that slight increases in wind speed have significant increases in energy content.

Refer to the table below for the wind resource in the western Cape (note mean wind speed (m/s) and average energy content (W/msq) per weather station is given at 10m heights).

Met Station	Speed / Energy
Table Bay	4.3m/s 125W/msq
CeresMet	3m/s 45W/msq
DarlingMet	4m/s 126W/msq
DeAarMet	7.4m/s 512W/msq
GeelbekMet	6m/s 304W/msq
KimberMet	4.9m/s 147W/msq
KlipheuwMet	4.0m/s 298W/msq
LaingsbrgMet	4.1m/s 102W/msq
LambertMet	4.3m/s 196W/msq
LangebnMet	7m/s 446W/msq
MalmsbryMet	4.5m/s 190W/msq
OlifantsMet	3.8m/s 190W/msq
PaarlMet	3.8m/s 192W/msq
PortervilleMet	4.3m/s 201W/msq
SimonstwnMet	6.5m/s 522W/msq
SpringbkMet	8.8m/s 868W/msq
StilbaaiMet	4.2m/s 187W/msq
StrandMet	4m/s 96W/msq
UpingMet	4.7m/s 136W/msq
WorcesMet	3m/s 51W/msq

4. TURBINE APPLICATION AND DESIGN

Environment

The wind resource is but one of the parameters that needs to be considered in siting a wind farm. The visual impact and impact on the natural environment is just as important.

Wind turbines obviously have to be highly visible, since they must be located in windy open terrain. Better design, careful choice of paint colours - and careful visualization studies before siting is decided - can improve the visual impact of wind farms dramatically. Some people prefer lattice towers instead of tubular steel towers, because they make the tower itself less visible. There are no objective guidelines, however. Much depends on the landscape and the match with architectural traditions in the area. Since wind turbines are visible in any case, it is usually a good idea to use them to emphasise natural or man-made features in the landscape. Like other man-made structures, well-designed wind turbines and wind parks can give interesting perspectives and furnish the landscape with new architectural values. Wind turbines have been a feature of the cultural landscape of Europe for more than 800 years and certainly in South Africa for at least 300 years.

Wind turbine manufacturers and wind farm developers have by now substantial experience in minimising the ecological impact of construction work in sensitive areas such as moors, or mountains, or when building wind farms in offshore locations. Restoring the surrounding landscape to its original state after construction has become a routine task for developers. After the useful life of a wind farm has elapsed, foundations can be reused or removed completely. The scrap value of a wind turbine can normally cover the costs of restoring its site to its initial state.

Deer and cattle habitually graze under wind turbines, and sheep seek shelter around them. While birds tend to collide with man-made structures such as electrical power lines, masts, or buildings, they are very rarely affected directly by wind turbines. A recent Danish study suggests that the impact of overhead power lines leading electricity away from wind farms have far greater impact on bird mortality than the turbines themselves. Falcons are in fact nesting and breeding in cages attached to two Danish wind turbines! Studies from the Netherlands, Denmark, and the US show that the total impact on birds from wind farms is negligible compared to the impact from road traffic. Birds often collide with high voltage overhead lines, masts, poles, and windows of buildings. Wind turbines seldom bother birds. Radar studies from Tjaereborg in the western part of Denmark, where a 2 megawatt wind turbine with 60 meter rotor diameter is installed, show that birds - by day or night - tend to change their flight route some 100-200 meters before the turbine and pass above the turbine at a safe distance. The only known site with major bird collision problems is located in the Altamont Pass in California. A "wind wall" of turbines on lattice towers is literally closing off the pass. There, a few bird kills from collisions have been reported. A study from the Danish Ministry of the Environment says that power lines, including power lines leading to wind farms, are a much greater danger to birds than the wind turbines themselves. Some birds get accustomed to wind turbines very quickly; others take a somewhat longer time. The possibilities of erecting wind farms next to bird sanctuaries therefore depend on the species in question. Migratory routes of birds will usually be taken into account when siting wind farms, although bird studies from Yukon show that migratory birds do not collide with wind turbines.

Resource

The energy content of the wind varies with the cube, (i.e. the third power) of the wind speed. Twice as much wind yields eight times as much energy. Manufacturers and wind farm developers therefore take extreme care in siting wind turbines in as windy areas as possible. The roughness of the terrain, i.e. the terrain surface, its contours, and even the presence of buildings, trees, plants, and bushes affect the local wind speed. Very rough terrain or nearby large obstacles may create turbulence, which may decrease energy production and increase tear and wear on the turbines. Calculating the annual energy production from a wind turbine is quite a complex task: It requires detailed maps of the area (up to three kilometres in the prevailing wind directions), and accurate meteorological wind measurements for at least a one year
period.

In reviewing the above table of wind resource it can clearly be seen that significant differences occur in the average energy in the wind in the western Cape ie the cumulative energy distribution or density of the wind resource.

The maximum energy that can mathematically be extracted from the wind is 59% of that shown above (Betz's law dictating that the wind behind the turbine can not be stationary).

The proposed Klipheuwel site has a mean wind speed of 4m/s with an average energy content of 300W/msq at 10m. Refer to the pictures below (figures 5 and 6) for detailed wind information (Position 1 indicates North).

Wind Speed m/s & Wind Directional Percentages

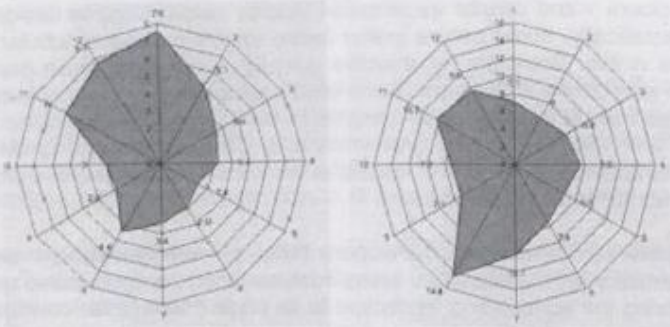


Figure 5. & Figure 6.

From the above and taking actual wind turbine efficiencies into consideration a capacity factor of between 20 to 30 % is obtained. This means that for every MW installed only 200 – 300 kW yield in average will be obtained per annum. This is sufficient for the purpose of test and demonstration but would pose a challenge to IPP's putting up a commercial farm in the western Cape.

5. WIND TURBINE COSTS

Wind turbine costs are still above US$1000/kVA or roughly US$ 0.05/kWhr over an estimated 20-year lifespan.

Typical operating and maintenance costs are 1.5% of capital cost or 10% of turnover based on the above. Refer to the table below for a typical commercial analysis based on an original capital outlay of R100M for a 10MW windfarm.

cents per kwlhr		R 0.30	R 0.35	R 0.40
R 100 Million				
STD	NPV (Million)	-R 19.3	-R 8.5	R 1.7
	IRR	9%	11%	13%
	BE (Year)	11	9	8
CO2	NPV (Million)	-R 11.9	-R 1.4	R 8.5
	IRR	11%	12%	14%
	BE (Year)	11	9	8

Assumptions:
CoC 12.5%, 40% tax, 5% tariff increase, 20 years straight line depreciation,
CO2 @ $10/ton, 30% Capacity Factor

6. CONCLUSION

Wind energy has become the least expensive renewable energy technology in existence. Since the energy contents of the wind varies with the cube (i.e. the third power of the wind speed), the economics of wind energy depends heavily on how windy the site is. In addition, there are generally economies of scale when building wind parks of many turbines. Today, according to the Danish electrical power companies, the energy cost per kilowatt-hour of electricity from wind is the same as for new coal-fired power stations fitted with smoke scrubbing equipment, i.e. around 0.05 USD per kWh for an average European site. R&D studies in Europe and the US point to a further fall in energy costs from wind of some 10 to 20 per cent in the next 5 years.

PRESENTATION AT THE AMEU CONVENTION – PRETORIA 23 OCTOBER 2001

Presenter: Beulah Misrole- MSc Engineering Business Management - Group Risk Manager Eskom - Distribution

THE RISK MANAGEMENT OF PUBLIC SAFETY

1. BACKGROUND:

Integrated Risk Management is an integral part of how we management our business. Our approach in Eskom Distribution is to manage the risk on a 20/80 principle. Through the practices of risk management we achieve the management of our pure and business risks which includes the requirements as set our in the king report (2nd draft) w.r.t. Corporate Governance and Ethics. Some of the benefits we derive are:

- **It enforces our interdependency on each other by creating opportunities to tap into our people's capacity and draw on the collective wisdom of all employees.**
- It creates and harmonises activities and processes in the organisation that supports our collective success and survival.
- It gives us a sense of mission – the opportunity to "sing from the same song sheet". It gives us the same value system and opportunity to bond in a common purpose to achieve goals. Whether these goals are to eliminate work /public related fatalies or generally to reduce our losses with the view of long term organisational survival.
- It creates constant new challenges and the opportunity to change and align systems, practices, processes and responses to meet these new challenges.
- It forces us to make choices. For example we choose to manage those critical risks that would give us maximum benefit.

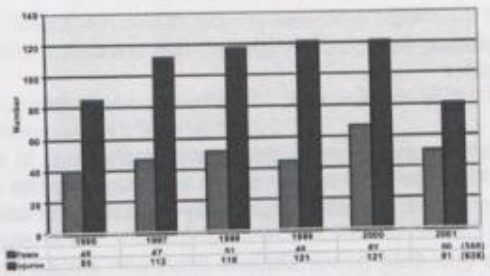
- It tests our leadership ability. It tests whether we will fearlessly take responsibility for decisions taken.

2. PUBLIC SAFETY RISKS

2.1 Introduction: During 1999 Public injuries and fatalities were identified as a critical risk.

2.2 HISTORICAL OVERVIEW: Our historical data of both injuries and fatalities flagged a problem. Our information relating to the takeovers of Transkei. Bothuputswana, Venda, Ciskei (TBVC) showed that 51 of the fatalities were directly linked with these newly takeovers.

Public Fatalities and Incidents
1996 to 2001 (August)



2.3 Critical Factors Influencing Public Safety Risk Profile (May 2000)

- **TBVC Take Overs:**
  - Increase in lines:
    44 -132KV= 29500 + *5620*
    = 35120Km
    1- 33KV = 162365 + *38086*
    = 200451Km
  - Condition of Lines
  - Increase Public
    Exposure = 7 million (SA only)
- **Electrification Project**
  - Increase network
  - Increase network expose
- **Client Base: SA**
- **Increase: Electricity,Copper and Cable Theft**
- **SPECULATIVE:**
- **Cross Border Migration**
  - **3-4million (French & Portuguese speaking)**
    - **Police est. 11million**
  - **Increase expose to network**
- **Literacy:**
  - **SA Stats (82%)**
  - **Independent Study (48%)**
  - **?effect of our literature**
- **Conditions at Schools**
  - **demotivated school teachers**
  - **Uncertainty of message to "at risk children".**

3. DISTRIBUTION STRATEGY:

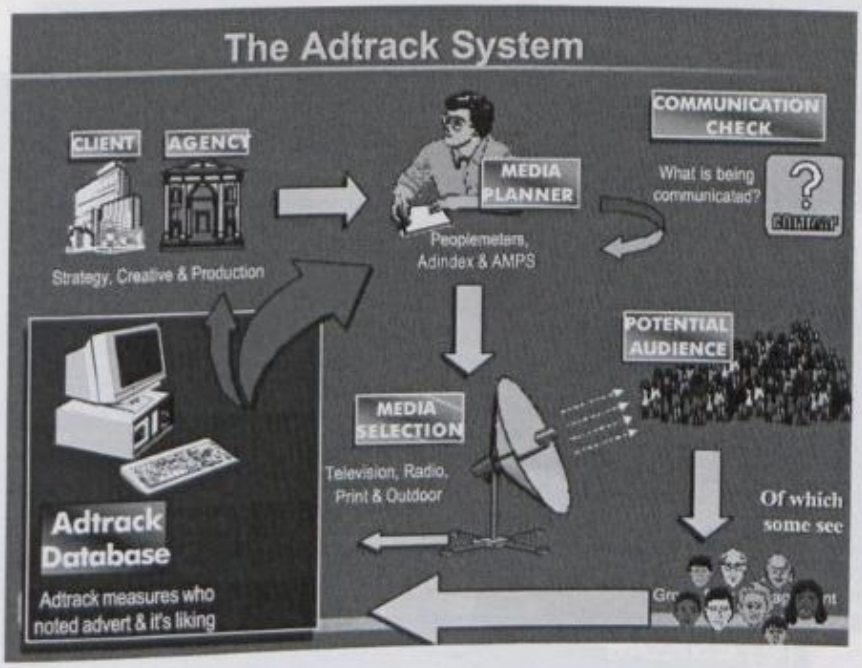
- **CRITICAL CAUSES** - Nationally
  - Low hanging conductors
  - Structures under lines
  - Objects into lines
  - Copper, cable and electricity theft (illegal connections)
- **STRATEGY**
  - National Mass Media Campaign – National Risk Specific
  - Primary intent – Educate
  - Secondary intent – "to scare enough to deter"
  - Operational Campaign – Regional Risk Specific

4. **NATIONAL CAMPAIGN ELEMENTS**

- Television Advertising
- Radio Advertising
- Kwaito Song
- Rand Easter Show
- Public Relations
- Internal Communications
  - 1 X TV Ad (Wheelchair) SABC 1,2, and ETV)
    - Fightings: 1 week- May, 4 weeks- July, 4 weeks- October & all weekends April – November
      - soccer
  - 3 X Radio Ads (8 African language stations and FM Radio)
    - 1 week-May, 1week end of June, 3 weeks-July, 3 weeks – October.
    - Kwaito Electricity Safety Song (Radio, TV and Competition)
- Song & Dance (live, neutral and earth – Rand Easter Show)
- Article in daily media
- Presentations, exhibitions and activities during "Safety Week"
- Media Tours
- Continuity presenters doing live safety reads in between shows

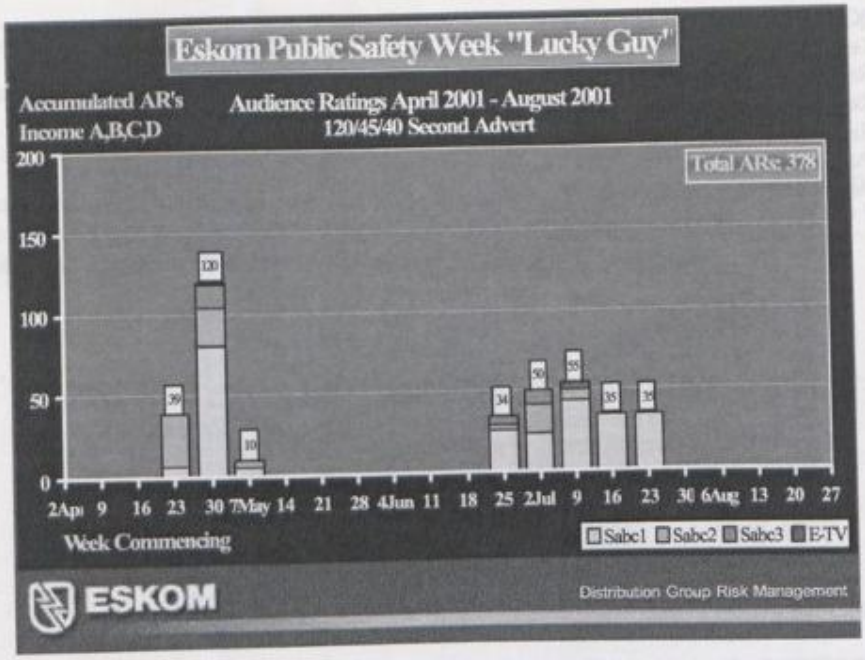
5. **ADVERT TESTING**: Public, Psychologist, Legal

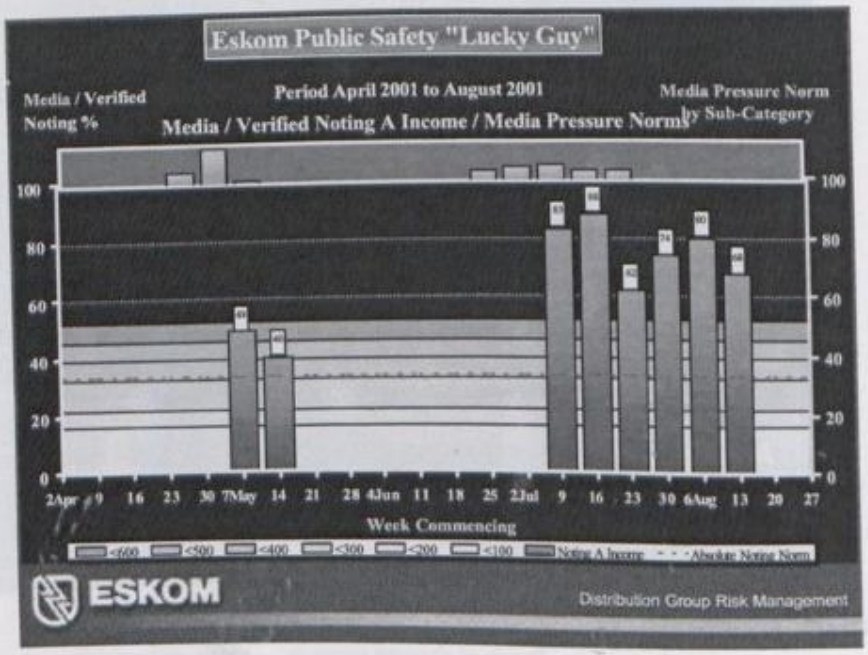
6. **AD TRACKING:** Formal form of evaluating the success of the campaign through a neutral body/organisation.

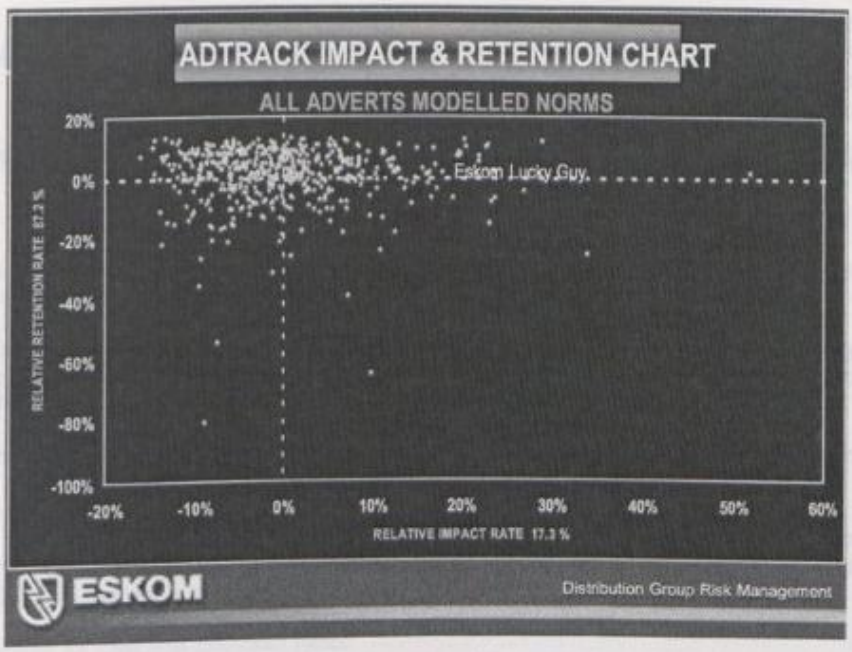


6.1 **AD TRACK PROCESS:**

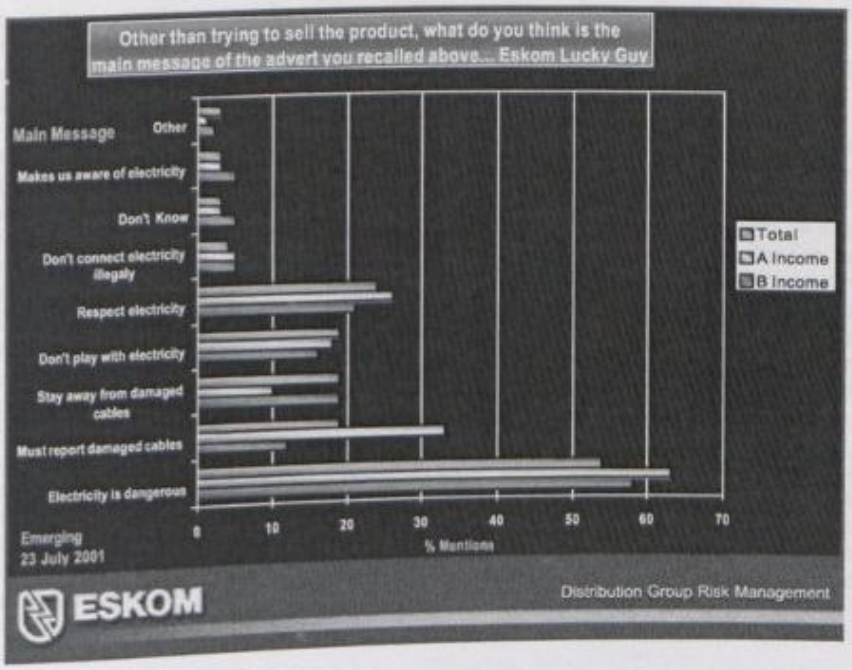
6.2 **EXTRACTS OF AD TRACT RESULTS**


Eskom Public Safety Week "Lucky Guy"
Accumulated AR's
Income A,B,C,D
Audience Ratings April 2001 - August 2001
120/45/40 Second Advert
Total ARs: 378
200
150
100
50
0
39
120
10
34
50
55
35
35
2Apr 9 16 23 30 7May 14 21 28 4Jun 11 18 25 2Jul 9 16 23 30 6Aug 13 20 27
Week Commencing
Sabc1 Sabc2 Sabc3 E-TV
ESKOM
Distribution Group Risk Management


Eskom Public Safety "Lucky Guy"
Media / Verified
Noting %
Period April 2001 to August 2001
Media / Verified Noting A Income / Media Pressure Norms
Media Pressure Norm
by Sub-Category
100
80
60
40
20
0
2Apr 9 16 23 30 7May 14 21 28 4Jun 11 18 25 2Jul 9 16 23 30 6Aug 13 20 27
Week Commencing
<600 <500 <400 <300 <200 <100 Noting A Income Absolute Noting Norm
ESKOM
Distribution Group Risk Management



7. RESULT OF MANAGING OUR PUBLIC RISKS



8. CONCLUTION

Our objective have been met within the following criteria

- Critical Business Risk Management
- Social Responsibility
- Corporate Governance

- Legal Liability
- Financial Impact
- Economic Value
- Tracking fatality record

As a bonus the TV commercial has been rated the "best liked commercial in the emerging market".

1st Place:	8.9 % liking – Eskom Lucky Guy
2nd Place:	8.7% liking – Coca-Cola
3rd Place:	8.2% liking – SA Tourism
4th Place:	8.2% liking – Eskom Kwaito

Beulah Misrole
Ph: 012 421 4748

MANAGEMENT OF TECHNICAL STANDARDS IN THE CHANGING ED

N R S

P A Johnson Pr. Eng. Chief Consultant Standards, NRS Project Management Agency
Eskom Resources and Strategy Group

INTRODUCTION

This paper reviews the current practices that lead to the establishment of technical standards used in the EDI, in particular the process that leads to the NRS specifications.

Considering the changes which the industry faces, and the changing environment in which it operates, proposals are made on how the current practices might need to be adapted, to ensure the benefits of standardization continue to be reaped by all stakeholders in the restructured EDI.

Progress towards the establishment of the Standardization arm of the proposed Industry Association for the ESI is reviewed.

The growing need for common standards for the ESI in the SADC region and among utilities throughout Africa is considered, and the progress towards establishing the framework for such common standards, through interfaces with PIESA 1) and UPDEA 2) is reviewed.

1) PIESA Power Institute for East and Southern Africa
2) UPDEA Union of Producers, Conveyors and Distributors of Electricity in Africa

THE HISTORY LEADING TO THE PRESENT PRACTICES

Some 12 years ago, as a result of a survey to explore strategic problems facing South African industry, problems in the field of standardization were identified as being of major significance. It was concluded that a specific effort to support the SABS on the national front was needed; in addition, some serious work was needed among electricity utilities in-house to promote the discipline.

On the ESI front this lead to the concept of what is now formally named the NRS Project for the ationalization of User Specifications (or NRS Project), which has been operating since 1989. In essence, NRS specifications are developed in co-operation between Eskom and municipal electricity departments represented by the Electricity Suppliers Liaison Committee (ESLC). [Of interest is that the out-going AMEU President, A J van der Merwe, is the sole remaining founder AMEU member of the ESLC] .Some 4000 pages of new, and revised NRS specification and amendments have been published since the project started, in over 160 separate publications (New or revised specifications or amendments, or ESLC reports). A paper bulletin published regularly up until 2000, has now been replaced by a web-published bulletin listing specifications published and work in hand. Web pages within the Eskom internal web site allow on-line access to the published documents. The external web site gives access to the bulletin and password-controlled on-line access for municipal staff under a license arrangement with the SABS, which remains as the formal publishing agent for NRS specifications.

Within Eskom, in particular in support of a serious attempt to lower connection costs in the electrification programme, standardization became entrenched in the distribution technology practices. This lead to the development of the Eskom Distribution Standard: a multi-part manual that ensures economical standard designs using the minimum range of equipment and materials. These continually updated practices form the basis for implementing Eskom's electrification programme and are also widely referenced outside Eskom by consultants and municipal engineers.

CURRENT PRACTICE

The ESLC, supported by the NRS Project Management Agency (PMA) continues to be the vehicle for developing and promoting rationalized standards for the EDI. The fact that the ESLC's activities continue to be well supported, voluntarily despite all the other calls on the members time in the protracted restructuring debate is a good indication of the value placed on the prime output, the NRS series of specifications. Of late, there has been an increasing demand

to re-publish mature NRS specifications, unchanged technically, as SABS standards. The consensus seeking process used has from the outset has been based on best practices used by standards

organizations world-wide. A two-stage voting process that provides for a) technical acceptance, and b) organization acceptance (commitment to use), seems to give the appropriate checks and balances.

The time to produce an NRS document from date of approval to start to publication, has stabilized over the past few years at 22 months, (Typically 30 months for a new NRS specification, 18 months for a revision, and 12 months for an amendment). To ensure a focus is in place of the time to produce, project leaders are assessed on the progress against a model programme. A criterion of a minimum of four active WG members is also set to ensure the PMA only proceed with work that is likely to achieve a level of rationalization, and that is genuinely needed. In contrast to the original premise that WGs would be disbanded once a specification had been published, it has been accepted by the ESLC that WGs remain dormant after publication , to be reactivated by the PMA for maintenance of the specifications under their charge. A system of customer feedback from the ESLC on each formally published specification provides an assessment in terms of timeousness, perceived value and content, as well as potential commitment to use of the specification.

The process of commenting on drafts and voting has become progressively electronic through the use of email and the internet. Faxes and posting of paper documents are now only used exceptionally.

Recognising the need to maximize the use of the WG members time, the number of WG meetings have been reduced, and in some cases where the WG is large, smaller task teams have been allocated the responsibility of developing certain stages of the specification. (The number of WG meetings rose from an average of 30 p.a. over the period 1995-1998, to an unsustainable 53 in 1999, and is now expected to remain in the region of 25-30 p.a.) Given the call on the time of a diminishing number of technically experienced staff to contribute to the WGs, even this may not be sustainable in the short term. Where it has been practicable, video conferencing has been used; with the drawback that the cost then has to be absorbed by the running cost of the PMA. Currently the cost of running the NRS PMA is around R2,5M p.a., for supporting the ESLC and the associated NRS activities. In effect, as these costs are born by Eskom Corporate, which staffs the NRS PMA, the cost of standardization is absorbed in the bulk tariff, with and the hidden costs of the voluntary contributions in time of the WG members, which is probably a comparable amount to the cost of the PMA covered by local authorities on an individual basis. In any future industry model. A decision on the funding mechanism to sustain these standardization activities will be needed. However, this is a subject for a separate debate on the funding mechanism for an industry association.

STANDARDIZATION AS A FUTURE INDUSTRY ASSOCIATION FUNCTION

Even if just the NRS activities in maintenance mode are considered, there is evidently a need to continue with that activity into a restructured EDI. There would be a smaller number of relatively larger players, but this does not reduce the need to continue to harmonize and rationalize specifications. Indeed it will be easier to achieve more direct representation with an ESLC that comprises direct membership of all REDs for example, but there would be a increasing need for commitment, as each RED would be autonomous and large enough to "go it alone". World wide, wherever the EDI has several players in a country, we see the presence of an industry association which more often than not has a standards function, that has similar aims to that of the ESLC and the NRS programme. (For example the EA in the UK which has produced the ESI series of specifications). It would be a relatively simple matter to ring fence the NRS PMA activities and second / transfer the function in its entirety to the industry association, with the ESLC, as a standing committee of the Industry Association becoming the standards approval body of the EDI. What is not so obvious is how this activity would be integrated with other standards resources that might be stranded in the EDI restructuring. The predominant one being Eskom Distribution technology functions, but also potentially standards function in the large metros. These could be justified in terms of there own REDs needs for an interface with the standards world (not only NRS but SABS and international standards bodies), but might be more effective as a distributed resource co-ordinated under the Industry Association umbrella. Certainly there is need to reassure the experienced technical staff such that do remain in these areas, that there is an overall plan to retain a function in the structures EDI. There is a real danger that such skills will be absorbed into the operational areas of the REDs or otherwise into consulting firms, if such options are seen as more certain by the staff concerned.

REGIONAL DEVELOPMENTS AND THEIR IMPACT ON LOCAL PROCESSES

In considering how the EDI locally might effectively retain a standardization function, the wider regional developments need to be considered. Within the SADC region, the Power Institute for East and Southern Africa (PIESA), established in 1998 has an active standardization initiative that by agreement with the ESLC runs a

parallel voting process for the rationalised specifications of common interest. Its focus is distribution specifications with many of the potential projects being reviews/adoption of existing NRS specifications. PIESA currently has 7 full (national utility) members, with the AMEU as an associate member. With its narrowing of focus on distribution activities in support of electrification in the region, as was agreed at the recent PIESA workshop in Lusaka, and the unbundling of national utilities regionally, we could expect PIESA membership to grow as distribution utilities see the benefits of membership. A prime benefit is the free access to PIESA and NRS specifications.

A reasonable expectation for the number of members , excluding the REDs in SA would be 8 –10. This is comparable to the expected number of REDs in SA. With more or less equal numbers of players, should the South African REDs simply join PIESA and merge all the NRS activities of the ESLC with the PIESA standards activities? It could be a viable option, as technically and environmentally, there are few additional requirements among distributors in the SADC region that are not covered by range of requirements SA. However, just as Eskom saw the need to continue with its standards programme in distribution, because of the inherent additional inertia in the NRS process, so SA REDs might be concerned about the inertia in the standardization activities of PIESA. An argument against this is the increasing use of electronic mail and the internet to progress standards activities, which allow effective participation of a larger number of geographically dispersed members.

Alternatively, we could continue with a standards activity in the SA utilities, and let individual REDs join in PIESA if they saw fit. Another option is to have the proposed Industry Association represent SA REDs collectively on the regional (PIESA) standards committee, which would be a small modification of the current arrangement whereby Eskom and the AMEU each have a seat on the PIESA Board. PIESA is not the only African utility association, and the Union of Producers, Conveyors and distributors of electricity in Africa (UPDEA) has been in existence for much longer than PIESA and has more members. Its membership is mainly from West, North and Central Africa, with there being two common members of PIESA and UPDEA; namely SNEL of the DR of Congo and Eskom. Recognizing the need to avoid duplication of effort in respect of distribution standards, a formal agreement to co-operate on distribution standardization activities has been developed, with UPDEA agreeing to adopt the processes used by PIESA, including the NRS PMA. Thus UPDEA collectively has a representative on the PIESA standardization committee. For the EDI locally, the message at this stage of restructuring is be aware of the options, and as we move towards an industry association ensure that plans remain flexible to accommodate any viable option.

CONCLUSIONS

- There is enough evidence globally and from local experience to expect that the EDI will continue to need a co-ordinating function for standardization.
- The existing ESLC concept and associated NRS Project Management Agency could easily be absorbed to
- perform this function as an element of an Industry Association.

The key questions that remain to be answered are:

- When? And,
- How will it be funded?
- There will have to be a conscious decision as to how the SA EDI standards activity will interface with the rapidly growing regional initiatives through PIESA and UPDEA.

MOTHER CITY BLACKOUT - MAY 2001

Brian Jones – City of Cape Town

First Events

In the early hours of the morning on Wednesday 2001-05-09 a fire developed in the 11 kV switchroom of Cape Town's 'City' main substation which resulted in an extensive loss of supply to significant areas of the CBD, Green Point and the V and A Waterfront.

The substation comprised 3 33/11,66 kV 25 MVA transformers feeding on to a 21 panel Reyrolle type B6T switchboard divided into three sections separated by bus section circuit breakers. The fire caused extensive damage to one section of the board and severe smoke pollution to the switchgear of the remaining two sections.

Once Electricity staff had isolated the damaged switchgear and feeders they set about restoring as much supply as possible to the affected areas by closing 11 kV electrical tie points to adjacent networks. All supplies were restored by 19:00 the same day, however in order to meet the following day's morning peak load it was essential that certain fire damaged feeder cables be repaired and the smoke polluted switchgear be cleaned and recommissioned the same night. Staff worked throughout the night to achieve this purpose. SCADA marshalling kiosks and control cabling had also been destroyed and essential alarms and measurements had to be 'jury rigged' back to the RTU. The 33 kV circuit breakers which cleared the fault were also maintained. The same night minor feeder rearrangements were also made to the 11 kV network in order to relieve overloaded feeders and better distribute the load generally.

Tremendous team efforts by staff from a number of Branches resulted in the remaining switchboard and two incoming feeders being recommissioned by 08:00, barely 28 hours after the fault, at which time all supplies were permanently restored.

Staff then set about removing the damaged switchgear, repairing the walls and roof of the building and modifying the cable trenches to accommodate the new switchgear. This work was completed by the following Wednesday.

Twelve panels of new switchgear were subsequently installed together with a joggle chamber to connect the new board to the old, and main and ancillary cables were terminated. Commissioning of the new switchboard including the incomer was completed on Thursday 2001-05-31, just three weeks after the fire.

What really happened?

It was only at this stage that focus could be shifted towards determining the cause of the fire.

Information from a variety of sources was obtained, collated, compared and analysed.

Photographs of the damaged switchgear taken in situ before the switchgear was dismantled (demolished) supplemented eye witness accounts of the state of the substation immediately after the fire.

SCADA derived alarms indicated that the first recorded event occurred when a breaker of a three feeder group tripped with the other two feeders of the group clearing the fault on backup protection about 50 seconds later. Four minutes number of seemingly unrelated alarms and events were logged due to alarm and tripping circuits being destroyed by the further useful information from SCADA from the City substation was logged thereafter..

The status of protection flags of the damaged switchgear was also found to be unreliable for the same reason.

A Quality of Supply recorder in the field indicated 3 supply dips at 04:22; 04:26 and 04:31. This correlated with the testimony of a member of staff who had claimed he had heard 3 very loud explosions at approximately the same times.

SCADA records from the 33 kV upstream station feeding 'City' indicate that all supply to City was tripped at 04:31 about 26 minutes after the first trip.

It appears most likely that the fire was started by a sustained cable fault which occurred within the substation on one of the cables which comprise the aforementioned 3 feeder group. The duty staff member at the Depot at which the City substation is located saw flames through one of the substation windows about one or two minutes after the first trips.

One of the explosions was subsequently found to have taken place in the cable box of an incoming transformer panel and of particular interest was a conductor of a single core cable in the box which had pulled out of its lug. There has been much conjecture as to precisely when the conductor pulled clear and whether perhaps overheating in the box actually caused an initial fire which spread and subsequently caused the 3 feeder group to trip. There is also the possibility that the fire began in the trench, perhaps due to spontaneous combustion or a low voltage cable fault, however most cables in the trench were badly damaged by the fire and any evidence to support this theory would have been destroyed in the fire. Arson has been ruled out as all entrances to the substation are alarmed and no entrance alarms were detected.

That the fire was concentrated in the trench there is no doubt, and the explosions were found to have been caused by flashovers which occurred both in compound filled ct chambers and busbar chambers of the B type switchgear. All bulk oil circuit breakers were found to be intact and no oil had been lost from breakers. The fire had been fed primarily by the wooden trench boards and the melted compound from the switchgear.

The fire brigade had been called out immediately the fire was detected and arrived on site within minutes. Only being provided with water to extinguish the fire, they had to wait until all connected circuits were confirmed de-energised before they could extinguish the blaze, which was subsequently accomplished about 1 hour 30 minutes after the fire began. This delay substantially increased the amount of damage caused by the fire.

Most important learning points and future considerations

1 Prior to the fire it had not been the practice to monitor switchgear rooms for fires or provide the rooms with automatic fire extinguishing equipment. Subsequently, fire alarms have been installed in certain strategic substations and further investigations are being made into the feasability of fitting these substations with automatic extinguishers. Some of the substation rooms are very large and they will cost hundreds of thousands of Rands each to protect.

2 Consideration has been given to reinforcing electrical 'tie' feeders between main substations in order to be able to import more power from adjacent substations into the area of supply of strategic substations in the event of the loss of an entire substation. This can also be very costly to achieve, however some 11 kV system alterations have already been made, and some are planned for the future. There does not appear to be any general practice in this regard and it is felt that such guidelines would be beneficial to the industry.

3 The frantic activities which were undertaken to rapidly restore supply and repair and recommission the substation resulted in a number of Branches and outside contractors working simultaneously in the same area. On review the activities of the various parties particularly from a safety perspective should have been better co-ordinated. One person should be clearly instructed to be in charge of safety in such circumstances.

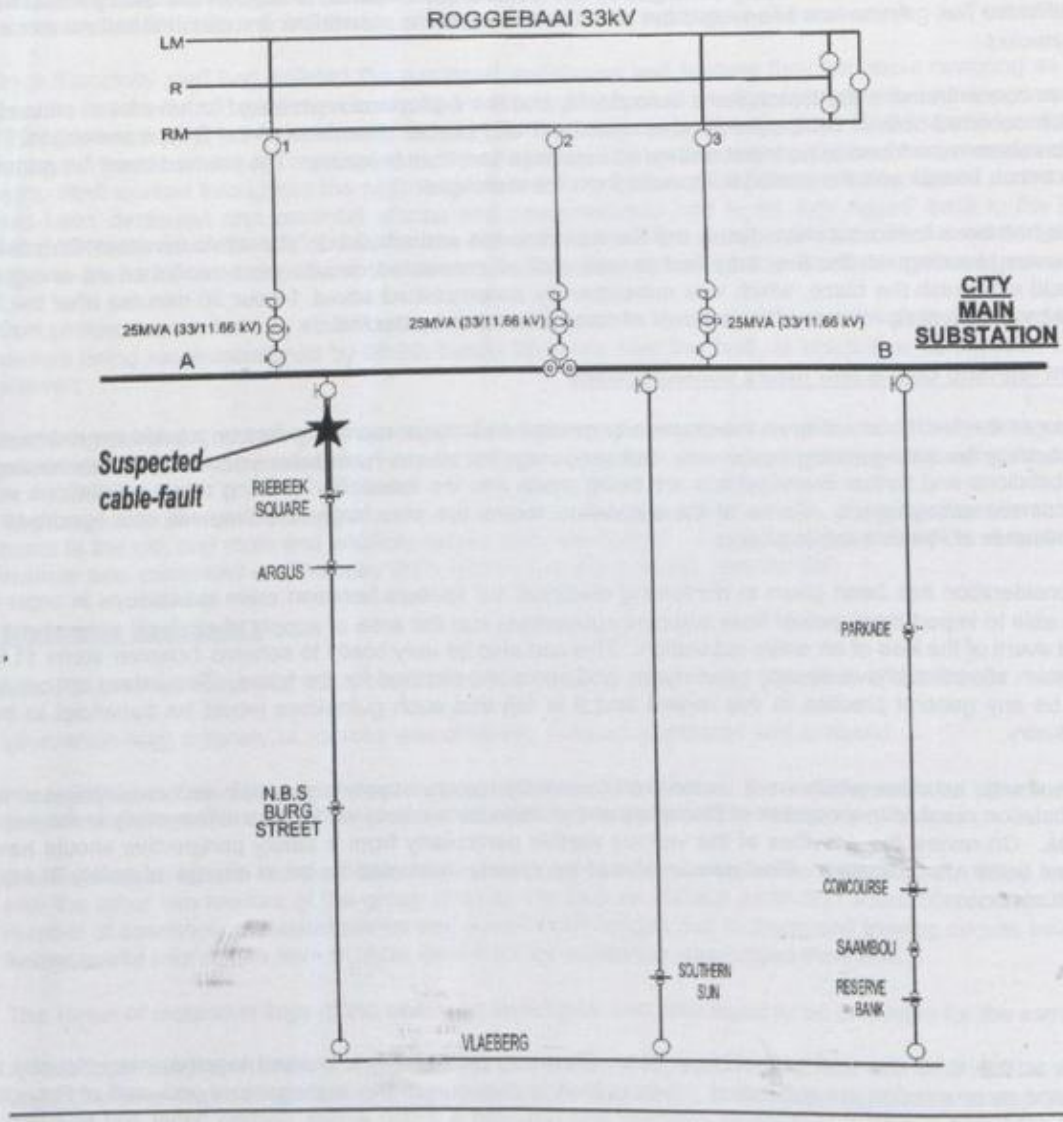
Last words

A big thank you is due to all the staff of the Cape Town Electricity Services who worked together magnificently to restore supply and recommission the substation. Recognition is also due to the management and staff of Reyrolle Switchgear who produced a custom built joggle chamber and provided a 2 000 A Bus Section panel and four 800 A feeder panels in record time.

It is planned to replace the remaining Reyrolle type B6T switchgear in the near future. Any parties interested in procuring some of the decommissioned equipment for spares or historical reasons should make representation to the City of Cape Town Electricity Services.

B JONES
CHIEF ELECTRICAL ENGINEER
CITY OF CAPE TOWN - ELECTRICITY SERVICES

MOTHER CITY BLACKOUT 11 kV SINGLE LINE DIAGRAM



TURNKEY PROJECT FOR THE NORMALISATION OF THE ELECTRICITY RETICULATION SYSTEM FOR MDANTSANE

Presented by: Robert Ferrier - Buffalo City

1. BACKGROUND/INTRODUCTION

In the mid 1990's the former township of Mdantsane was incorporated into the Transitional Local Council of East London, which is now part of Buffalo City. When the Buffalo City Municipality took over the Mdantsane electrical network very little upkeep and maintenance had been done on the electrical network. Because of this the network was in a very poor condition. This prompted the council to invite tenders for a Turnkey Project to Rehabilitate and Maintain the Electrical Network. Along with poor state of the network Madantsane also had a R33 Million debt for electrical use.

The Mdantsane Electrical Turnkey Project contract ED191was awarded to a Siemens-led joint venture. The other members were local East London companies (PSU, DLV, PERFORMANCE ELECTRICAL, PAS, INGCALI) in June 1998.
In July 1998 Abase Monti assumed work on the 4-year contract. The contract has two distinct sections each having its own duration.

(a) Rehabilitation of the Electrical Network, this section also having within it two sections of work these being:

1. Upgrading and Refurbishment of the Electrical Network.
2. Installation of Prepayment Meters.

(b) Maintenance and Operations of the Electrical Network.

(a) Having a two year duration and (b) having a four year duration, the first two years running concurrently with Rehabilitation.

The aim of the tender was as follows:

- Rehabilitation of the Electrical Network (ensuring all relevant safety and electrical standards were met)
- The recovery of the R33 Million arrears
- Operation and Maintenance of the Electrical Network
- After rehabilitation keep losses within acceptable parameters
- Converting 19000 existing domestic consumers to prepayment meters
- Installing 10000 new prepayment to new consumers on registered erven

Initially the cost of the capital component of the project was set at R29 Million for the Rehabilitation section of the contract. After a remeasusement of the complete works the final capital cost was R62 Million. The Operations section contract was fixed R31 Million. (All values exclude V.A.T.)

2. MDANTSANE COMMUNITY

Mdantsane is the second largest of the former townships in South Africa with an estimated 300000 residents. The project received divided support from the community. Most of the community was enthusiastic about receiving a stable and safe supply, (before the project the community was used to outages that could last up to a month) while others seemed to fear loosing the "free" if unstable supply.
Tampering and bypassing of electricity was rife with virtually no consumers paying for electrical use. Mdantsane has a large number of informal areas, which contributed to illegal connections.
Because of the entrenched mindset of services without payment the contractor had to hold community meetings throughout the contract to inform the community of the benefits that can be gained from payment for services. During the meetings the benefits of using electricity over the use of other forms of energy and the safe use of electricity were discussed amongst other topics of concern brought up by the community. Up to 4 meetings a week were held in the areas where the contractors were working. A total of 260 meeting were held throughout the rehabilitation phase.
Meetings are still being held during the maintenance phase of the project on an as needed basis.

Information on consumers in Mdantsane was sketchy. It was therefore necessary for the contractors' Representatives to visit each consumer or prospective consumer to ensure that information used on the contract was as accurate as

possible. These visits were useful not only to gather information and fill in the forms required but also to inform consumers of the project on a one to one basis.

It was this type of personal service that helped the project to succeed and helped convince the community that the project was for their benefit.

3.REHABILITATION PHASE

One of the major problems faced on the Mdantsane project was that, unlike other electrification projects, Mdantsane was a working network with existing consumers (Domestic and Commercial). This meant that while rehabilitation was being carried out interruptions had to be kept to a minimum.

(Photographs attached as appendix A)

Listed below are some of major work items used to plot progress during rehabilitation (graphs attached as appendix B)

1. 3500 POLES REPLACED
2. 300 NEW TRANSFORMERS INSTALLED
3. 300 OLD TRANSFORMERS REFURBISHED
4. 2MILLION METERS OF OVERHEAD LINE TENSIONED

After an initial slow start and change of Project Manager the rehabilitation of the network was completed in an effective 18 months.

4.PREPAYMENT METER PHASE

With the incorporation of Mdantsane the local council inherited a R33 Million arrears debt. One of the major aims of the project was to collect all outstanding arrears. The first thought was to disconnect defaulters, which would have been all existing domestic consumer and most commercial consumers. This was tried at the start of the project, but was found to be ineffective. As project was aimed at converting all domestic consumers to prepayment meters it was decided to use this as our means of ensuring payment for services. The monthly target set for conversions was 2000, with new installations set at 850. The contractor in the first few months of the project did not perform very well which was of concern to the Council as there was a real possibility of loosing NER funding for the project. After a very urgent meeting with contractor to air our concerns and dissatisfaction with their performance up to that time, assurances where given by the contractor to make up the backlog and ensure that NER funding was not lost.

All targets where met by the contractor with installation of meters being completed in 2 years

Listed below are the key progress indicators used to track progress on the meter installation phase:(Graphs attached as appendix C)

1. 18500 EXISTING CONSUMERS CONVERTED TO PREPAYMENT METERS
2. 10000 NEW CONSUMERS ADDED TO THE SYSTEM BY INSTALLING PREPAYMENT METERS
3. 28500 CONSUMERS SWITCHED ON TO THE SYSTEM USING PREPAYMENT METERS

5.ENERGY MANAGEMENT

The Buffalo City Municipality having spent a substantial amount of capital funds on upgrading the electrical network, in Mdantsane needed to ensure that a return was gained, this meant that losses needed to be maintained to minimum. The contractor offered to contain network losses to 18%, which includes transformer, line poor maintenance and tampering.

To achieve this a number of methods of Energy Management are being used.

METHOD ONE: Two preventative maintenance teams rove throughout Mdantsane. They are used to do the following:

1. Low consumption investigations
2. Installation of new consumers
3. Systematic checks of all houses in Mdantsane for by-passing, tampering, earthing and any other fault
4. Data gathering
5. Disconnections and re-connections of commercial consumers

METHOD TWO: A full audit of all commercial consumers has been carried out to regularize the supplies. During the audit the following types of faults were found:

1. Meters incorrectly wired (meter not reading full consumption)
2. No meter: - consumer connected directly onto the system
3. Meters by-passed or tampered with
4. Meters vandalized (did not read consumer consumption)

During the audit all consumers not on the meter-reading schedule were also identified.

METHOD THREE: A low consumption report is run every two to three months. This report is used to identify consumer to be investigated. Mdantsane has a diverse consumer base, from very low to high middle income, because of this it has been found that a large number of Mdantsane consumers will always appear on the low consumption report, these consumers are excluded from the investigation, this is to try streamline the process and concentrate on consumers that have possible tampered (The low consumption consumers are checked during preventative maintenance)

METHOD FOUR: This method is still being refined and will be used as an aid to identify areas of high losses. This method uses the Mdantsane layout, which divides Mdantsane into 17 zones, and the design layout, which divides each zone into transformer areas. Below is an explanation of the flow chart attached as appendix D.

1. At point 1 ;this is the ESKOM metering point (there are two points in Mdantsane :Potsdam Switching Station and Buffalo Substation) ESKOM provides a combined consumption which is then compared to the total of points 2 and 3
2. At point 2 ;all the commercial bulk meters not within the domestic network are added together after being read.
3. At point 3;all the statistical meters on each transformer are read. Then each transformer reading is compared with the total sum of points 4 to 7 . As some of the readings given by points 4 to 7 have a margin of error, a 10% variance is applied which means that if the total of points 4 to 7 is not within the allowed variance that transformer area of 50 houses and commercial connections are checked for tampering. Then the transformers within a zone are compared to the total power used for that zone also applying the some margin of error. A further comparison is made with the total power used within the domestic network. The total readings of all the transformers is then combined with the readings from point 2 and compared with point 1.
4. At point 4; domestic consumption is taken from the electricity sales for a given period. As some of the electricity in this period would not be used during the comparison period a margin of error would be expected but what needs to be established is a trend and a variance of this would indicate a problem the error is of no significance.
5. At point 5;all streetlights and high mast lights have been identified into which transformer area they belong. This consumption is calculated.
6. At point 6; this consumption is the total of all commercial supplies connected to a transformer and are all read.
7. At point 7; this is a total of all municipal installations supplied by a transformer and are all read

Using the above forms of energy management the municipality has been able to reduce the loss of electricity from theft to less than 2%. (This has been confirmed by an independent investigation)
It has also though the installation of prepayment meters been able to decrease its arrears owed to it substantially

CONCLUSION
While the municipality has had problems throughout the contract the final results achieved have been more than anticipated . The Buffalo City Municipality can boast that the have one of the lowest tamper rates in the country and the income know being generated from Mdantsane justifies the capital cost of the project. It can also be said that this project is one of the most successful community project run in the country.
Other key indicators to the success of the project are shown on the graphs attached as appendix D;

- REVENUE/MAXIMUM DEMAND
- REHABILITATION/MAXIMUM DEMAND
- REVENUE/REHABILITATION
- ARREARS DUE/ARREARSPAID
- ESKOM INVOICES/PREPAID METER REVENUE

ESKOM AND THE ELECTRICITY BASIC SERVICES SUPPORT TARIFF (EBSST)

By Deon Conradie,

Electricity Pricing Manager: Eskom

1. Introduction

In November last year President Thabo Mbeki announced the Government's commitment to provide free basic water and electricity in an effort to provide poverty relief. Census results have shown that many South Africans are living in extreme poverty, struggling to afford the basic necessities of life. Although the target of the National Government for social upliftment is mainly the poor, it is not easy to identify poor households and therefore it was agreed that free basic electricity would be provided to all legally connected households.

A lot has been said and written about "EBSST" i.e. Electricity Basic Service Support Tariff, known as Free Basic Electricity supply in the papers and on radio. Eskom supplies electricity to about ± 3 million customers nationally that are affected by this initiative. Although the price of electricity in South Africa compares favourably with other countries, the issue of affordability is still a major problem for the indigent. Energy plays a significant part in our life, which makes access to energy important.

The Department of Minerals and Energy (DME) proposed that a basic amount of 50kWh be provided free per household. Customers using more that 50 kWh per month will pay for all the electricity consumed above this amount if no other funding mechanism is available. Strict credit control measures and revenue management must and will continue to be enforced.

2. EBSST: The Eskom Approach

As a responsible corporate citizen Eskom supports the notion of free basic services to alleviate poverty amongst the people of South Africa. Eskom further supports the Government in its view that the full implications must be understood and the necessary systems be in place before the programme could be fully rolled out. Eskom has approximately half the domestic customers in the country, which poses a huge logistical challenge in implementing this to our customers as they are scattered all over the country.

Some of the challenges facing Eskom are related to issues around pre-payment metering technology, as the current system cannot vend free basic electricity. Issues like the re-programming of current software associated with pre-paid meters, information systems and the replacement of older meters that cannot be reprogrammed to handle a free block of energy, have to be addressed.

The anticipated revenue shortfall for Eskom as a result of free basic electricity has been estimated at R500 m per annum, based on the number of residential customers receiving 50 kWh free per month. A sustainable funding mechanism therefore needs to be established. There are a number of different ways that free basic electricity can be funded such as, through the fiscus i.e. paid from the tax base; through increases to tariffs by means of an overall increase or through a national levy on all electricity generated. However, there has been no final decision on funding.

This does not prevent Municipalities from providing free basic services in their areas, but Eskom will work in terms of the Government led EBSST framework and process.

3. The EBSST Framework: The Pilot Process

Cabinet approved funding for the small scale piloting of Free Basic Electricity in identified nodal areas during the 2001/2002 financial year. As Eskom supplies electricity to the customers in these nodal areas and has the capacity and resources, it consequently accepted the request from the Department of Minerals and Energy (DME) to run the pilot sites in the eight identified rural developmental nodes (see below). This will be done under the guidance of the Department of Minerals and Energy's EBSST Task Team with industry wide representation.

The pilots have been implemented as the equipment became available from October 2001 and will run until February 2002. This means that free basic electricity will only be available in these selected pilot sites. It is not foreseen that it will be made available to customers outside of these developmental nodes before a Cabinet decision.

Eskom is required to provide a report on the pilots to Government by end February 2002. Cabinet will then make a final decision regarding the full implementation of Free Basic Electricity to all customers.

The final implementation date of free basic electricity in Eskom areas will depend on the capacity of Eskom and the funding mechanisms used. Eskom cannot predict the exact point in time the full-scale programme of free electricity will begin, but phased implementation will most probably start from the 2002/2003 financial year onwards pending a final decision on implementation by Cabinet.

4. The EBSST Pilot Sites: Setting our sites

At the prepaid sites existing Credit Dispensing Units (CDU) and System Master Stations (SMS) are swapped out with prepayment systems that have been upgraded with the EBSST (Free Basic Electricity Support Service Tariff) software specifications. The Prepaid sites are:

Site	Region
Tambo	Southern (near Queenstown in Eastern Cape)
Antioch	Eastern (near Durban)
Makepsvlei	North East (near Groblersdal)
Garagopola	North East (near Burgersfort)
Gasese	North West (near Hotazel, Northern Cape)
Tsening, 1.5km from Gasese	North West (near Hotazel, Northern Cape)
Marapong	North (Ellisras)
Mathope Stad	North (between Derby and Magaliesburg)
Molote City (next to Mathope Stad)	North (between Derby and Magaliesburg)
De Oaks	North (Phalaborwa)

- **EDRC Sites (Bonesa)**

In Zwelitsha and Dengwane in the Eastern Cape the SMS and CDU systems will not be replaced, as Bonesa will provide lamps to customers to assess the impact of these lamps opposed to the free basic 50 kWh. In addition the EDRC (Energy Development Research Centre) of the University of Cape Town are working in conjunction with the load research unit of Eskom to conduct research on the social aspects, and investigate the impact on the loads.

- **Combined Conventional and Prepaid Site**

Abbotsdale, near Belville in the Western Region is a combined conventional and pre-paid site, where the impact on the CRP and the prepaid systems will be assessed.

5. What the programme will be testing

The overall programme will look at aspects such as changes to technology and software related to prepayment meters, which cannot vend free basic electricity. Manufactures of CDUs and SMSs have been invited to submit upgraded machines for testing. These are being tested to check whether the issuing of tokens and uploads to CRP are done correctly.

The testing include:

- the reconfiguring and upgrading of metering and billing systems to link into Eskom's financial systems;
- a revised tariff structure or funding mechanism,
- identifying funding options for the technology and system upgrades for implementation;
- the impact on customer spending and load profiles;
- the impact of such a program on systems, personnel, customers, logistic, networks, finances and credit management, as well as,
- the need to develop a sustainable process.

6. Conclusion

It is clear that Eskom fully supports the notion of free basic services as announced by government. However, Eskom is of the view that the full implications must be understood and the necessary systems must be in place before the programme can be fully rolled out, taking into consideration the logistical challenge of such a programme on Eskom.

Some of the challenges facing Eskom are related to issues around pre-payment metering technology such as the re-programming of current software associated with pre-paid meters; information systems and replacement of older meters that cannot be programmed to handle a free block of energy.

Eskom will work in terms of the Government led EBSST framework and process and have agreed to the DME request to run the EBSST pilots in the rural developmental nodes. They will provide Government with a report on their findings by February 2002. Phased implementation within the guidelines of the DME will commence once Cabinet has made a final decision on implementation and has agreed on an appropriate funding mechanism.

COMMITTEE REPORTS

NATIONAL ELECTRIFICATION COORDINATING COMMITTEE

P E Fowles, SALGA Representative

The National Electrification Coordinating Committee (NECC) has been planning since 1999 for the establishment of a National Electrification Fund (NEF) and a system to process applications for funding of new 'electrification' connections.

Howard Whitehead has been the main SALGA representative on this committee, assisted by Deon Louw, Danie Potgieter and Peter Fowles on the various Task Teams that carried out much of the work considered by the NECC Plenary.

This work is all but over now with a NEF established through an annual contribution from the fiscus for the next three years of R600 million (R1,2bn estimated requirement to meet the connection targets). A business planning and

modelling function that will evaluate and approve applications for funding has been outsourced to a 'ringfenced' section of Eskom.

A National Electrification Advisory Committee (NEAC) will shortly be established to take responsibility for this process. Applications for electrification funding from March 2002 will be submitted to this new structure and members will shortly be advised of procedures to follow.

Report on the Proceedings of the Publicity and Training Committee for the 57th AMEU Convention

The AMEU as a whole has experienced a very busy year with restructuring within the national as well as the local arenas taking place at a break neck speed. The Publicity and Training Committee was no different. In both these sections a lot has happened.

4. Publicity

The main thrust of publicity for the AMEU has continued to be the publication of AMEU NEWS. This newsletter is published three times a year and is distributed free of charge to about 1500 readers. The readership covers most heads of departments in our member undertakings, various state and provincial authorities, numerous senior Eskom staff members, all our affiliate members and persons in a number of other organiztions which have requested copies over the 15 years of the publication's existence.

In addition, the AMEU website is proving to be popular amongst many persons with internet facilities. The site is regularly updated and displays extracts from the newsletter, a spread of tariff information, accident reports and various other items of relevance to the industry.

Our editor of the AMEU news proved to be quite a rebel with his editorial column. Max Clark left no stone unturned nor did he pull any punched in his critique of the Eskom annual report. He certainly showed that a report like this should not just be glossed over as he pointed out some contentious issues.

Some changes have been made to the way the proceedings of the convention will be presented and it was decided to make use of newer technologies by presenting proceedings on CD ROM. The proceedings will also be recorded onto our web. But for our more (much more) experienced members a hard copy will also be available but not in the usual glossy format.

5. Training

2.1 AMEU/ESKOM Combined Training Task Team

Training has really seen some movement. The AMEU/Eskom joint venture has finally received recognition when it was accepted by the EDIRC as an official task team for RED restructuring. Prior to this achievement in August this year the group proceeded with its battle to get the Energy SETA and the LGW SETA to join forces and put electricity distribution training under one single umbrella. To this point a start was made in the creation of an EDI SGB(Standards Generating Body). This SGB was accepted by SAQA(SA Qualifications Authority). The process will be to establish this body with the intention of creating learnerships that would suit the needs of the future EDI industry.

The seven training centres under the auspices of the AMEU as well as the Eskom centres showed their absolute commitment in getting training to work. The managers of all these centres really showed that they had a drive to make training work and they must be congratulated for the work that was put in. These managers are: Llewellyn Stewart and Geoff Sleight of City Power, Graeme Hopewell of Nelson Mandella Metro, Phillip Jacobs of Eastrand Metro, Mickey Reinhardt of Durban Metro Electricity, Don Early City of Cape Town Electricity, Frik Terblanche of City of Tswane, Petrus van Zyl of Mangaune Municipality and Naude van Rensburg and Jeff Victor from Eskom.

2.2 Bursaries

The AMEU decided to change its bursary scheme by donating funds to various universities with electrical engineering facilities. The money donated is to be used by universities on deserving students with preference given to previously disadvantaged individuals.

2.3 Special Management Retraining Courses

Various universities and institutions such as ESKOM has been approached to create courses that would assist the typical municipal manager to convert to a business orientated manager. The REDs will be run as companies and as such will use the GAAP (General Accepted Accounting Principles) financial systems whereas municipal officials are used to the GAMAP (General Accepted Municipal Accounting Principles) systems. These systems are worlds apart and it is therefore considered essential that the municipal manager be converted to the business type systems to be able to compete with their ESKOM counterparts.

I would like to thank the members of my committee as well as those non-members also attending, for their dedication and lively debating of issues on the committee. These members are: At vd Merwe, John Ehrich, Peter Fowles, Neil Croucher, Howard Whitehead, Paul van Niekerk, Hennie Auret, George Ferreira, Danie Potgieter, Al Fortman Technical Secretary and Max Clark Publicity Secretary.

Lastly I want to express my sincere gratitude for the work done by our General Secretary, Jean Venter. Without his drive and diligence this committee would surely not have existed.

Thank you,

Deon Louw
Chairman: Publicity and Training Committee

PROGRESS REPORT ON SABS RELATED COMMITTEES.

Report Covering the Period January 2001 up to June 2001.

Report to the Executive Council on 12 July 2001, the five Branches thereafter and AMEU Convention in October 2001.

In accordance with the Terms of Reference for the Technical Secretary, the following report is submitted:-

- **Report on the Electrotechnical Sector Board (SABS SB1):**

Two Electrotechnical Sector Board meetings were held during the six-month period January 2001 to June 2001. The first one took place on 21 February 2001 and the second on 6 June 2001.
Meeting of 21 February 2001:
Meeting held on 21 February 2001:
Mr I Kruger was re-appointed to the Conformity Assessment Board for a further term of three years. The meeting was advised that South Africa needed to have an alternate member.
Concerning "Standards into Africa", it was reported that the task team had not yet met, but that PIESA and UPDEA are ongoing initiatives. The task team of Dr CJ Johnston, Mr P Johnson and Mr V Cohen, with Mr P Johnson as Convenor, were asked to report progress at the next meeting.
The Schedule of future General Meetings of the IEC were tabled and the 2005 General Meeting will be held in South Africa, either in Johannesburg or Durban. Apparently Cape Town does not have the necessary facilities.
Various matters were reported on concerning IEC Meetings which were attended, of which a few are reported on.
There is a move to open up membership of the IEC to a wider spectrum of countries.

New offices are to be established in Singapore and the United States of America, either in Boston or Atlanta.
The question of crime in South Africa is a factor which could compromise the South African invitation to the IEC to meet here in 2005.
National Standards Day will be repeated on 10 October 2001. A half-day conference will be held, defining the work of ISO and the IEC and an afternoon workshop would be held.
Under a separate heading, the burning issue of the conflict between Manufacturers and Importers was discussed and whilst it was outside the mandate of the ETSB, Dr Ellman conceded that there were specific issues that kept coming up repeatedly and had to be addressed before being put to bed and possibly passed onto some other body.

Meeting held on 6 June 2001:
Mr Vinod Singh was proposed by the Electrotechnical Sector Board to be the South African alternate member to the Conformity Assessment Board.
The performance of and continued support for the South African members elected to mangement committees of the IEC will be reviewed at the first meeting of each year of the Electrotechnical Sector Board.

- **Report on the Electricity Suppliers Liaison Committee (ESLC) meetings.**

Two meetings of the ESLC were held during the first half of 2001. The first meeting took place on 15 February 2001 and the second one on 11 May 2001, where the AMEU's representative is Mr Hannes Roos, who unfortunately was not able to attend due to reasons beyond his control, besides the seven large municipalities, previously known as Pretoria, Bloemfontein, Cape Town, Durban, Johannesburg, Port Elizabeth and Tygerberg and where Durban and Cape Town have retained their original names. The Technical Secretary also serves on the ESLC as an AMEU representative. The Chairman of the ESLC is currently Mr Roy Wienand from Durban Electricity and the Secretary is Mr Alvin Fredericks from ESKOM.

Numerous NRS Projects in progress were tabled at both meetings together with NRS Project Management Agency (PMA) reports and an explanation given on the progress of the projects by Mr Paul Johnson of ESKOM.

Of particular interest in the PMA report, is the item under 'New Work for Approval', concerning a report for the Department of Labour on illegal connections and unsafe clearances associated with informal dwellings. A report was received from Mr Alan Gower, erstwhile of Durban Electricity. Comments on this report were requested from ESLC members to reach the Secretariat by 25 May 2001.

To report on the progress on the 'Certificate of Compliance' concerning the wiring of premises and amendments to the OHS Act Regulations, which were also reported on in the previous report to the Executive Council, the ESLC was informed that no progress had been made, in spite of undertakings by the Department of Labour that it would facilitate the necessary working groups or meetings on this issue. It is apparent that there is little or no communication within the ranks of the officials at the Department of Labour on this matter, with the result that no progress is made. The attitude within the Department of Labour appears to be apathetic.

- **Report on the progress of SABS and NRS Technical Committees.**

The AMEU serves on twenty-one SABS Technical Committees and NRS Working Groups, which include the Electrotechnical Sector Board and the SABS Code of Practice – SABS 0480: Quality of Supply Working Group and five NRS Working Groups.

The Technical Committees are the following:-

TC 62 Electrical Measurements
TC 64 Lighting and Optics
SC 64A Lamps and Auxiliaries
SC 64C Luminaires

TC 66 Electric Cables

TC 67 Electrical Distribution Systems and Components
SC 67A HV Switchgear
SC 67B LV Switchgear
SC 67C Electrical Accessories

SC 67D Insulators
SC 67E Electrical Distribution
SC 67F Electrical Installations

TC 69 Power Electronics

TC 73 Electromagnetic Compatibility

Code of Practice – SABS 0480 : Quality of Supply Working Group

Electrotechnical Sector Board (SABS SB1)

NRS Working Group 059: Minimizing Theft of Copper

NRS Working Group 060: Safety Clearances

NRS Working Group 066: MV Insulators

NRS Working Group 068: Earth Fault Indicators

NRS Piesa Working Group: LV Cables.

The following Committee Meetings were held during this period and are given in date order.

18 January 2001	NRS 060	Report by Gerrit Teunissen
2 February 2001	SABS 0480 (NRS 048)	Report by Tony Dold
7 February 2001	SC 67C	Report by Leon Fourie for Hannes Roos
7 March 2001	SC 67D	Report by Japie de Villiers
14 March 2001	TC 62	Report by Vinod Patel
16 May 2001	SC 67A	Report by Leon Fourie for Hannes Roos
23 May 2001	TC 73	Report by Japie de Villiers
30 May 2001	SC 67B	Report by Leon Fourie for Hannes Roos
20 June 2001	TC 66	Report by Japie de Villiers
No date available	NRS 059	No meeting, no report (Gerrit Teunissen)
No date available	NRS 066	No meeting, no report (Japie de Villiers)
No date available	NRS 068	No meeting, no report (Mark Walter)
No date provided	NRS PIESA WG	Representative is Japie de Villiers (To ensure the ESI's input)

Summarised versions of the reports are submitted :-

- **18 January 2001 : NRS 060 Meeting : Gerrit Teunissen.**

The NRS Working Group deals with Safety Clearances.

A well attended Workshop was held on 18 January 2001 to address the concerns which were received after the publication of the first draft of NRS 060 (Minimum Clearances).

Many concerns were of a technical nature and the feasibility for implementation.

A revised draft will be distributed to the Working Group members. The aim of the Working Group is to have a document which will be practical in its use and a valuable tool for all concerned.

- **2 February 2001: SABS 0480 (NRS 048) Meeting: Tony Dold.**

A meeting of the Working Group was convened by the Standardisation Manager for NRS Projects to consider the comments received from the AMEU members to the proposed revised draft of NRS 048-3 and also to attempt to

satisfy the NER's expectations in respect of utility reporting of Quality of Supply statistics. This was held at the offices of Durban Metro Electricity.

Mr Pravesh Balgobind of the National Electricity Regulator repeated the concerns of the NER which had been raised at a previous meeting in December 2000, namely that the present reporting requirements did not satisfy the NER's responsibility to gather, monitor and publish quality of supply data that is meaningful to customers. He also referred to the failure of some utilities to submit reliable information, even in the present form. Although the latest draft still did not satisfy his expectations he agreed to participate in the analysis of comments submitted by the AMEU and ESKOM contributors in response to the faxes sent out referring to the draft on the NRS web-page.

Thereafter all comments that had been collated by Mr Johnson, were discussed and the draft edited as agreed.

Mr Johnson will send the edted version to Mr Manfred Kuster, who will draft a document to highlight and justify the changes that have been made when compared with the current published version.

It is expected that this combination of draft and justification will then be submitted to the following in turn, assuming acceptance at each stage: -
The NRS 048 Working Group for final scrutiny.
The ESLC in the usual manner, including voting.
The NER with the suggestion that this be adopted.

The meeting noted the following comments during the deliberations on the above: -
Mr Balgobind stated that the NER was considering setting the reporting requirements along the USA or UK lines.
Mr Balgobind stated that utilities need to work towards being able to collect customer specific data in the long term. For example, to be able to record how many customers of each category have been affected by each supply interruption.
It was agreed that the need / desirability / benefits of the Type A instrument for the purpose of sampling LV customer regulation and interruption performance should be re-considered by the Working Group.

- **7 February 2001 : SC 67C Meeting : Leon Fourie.**

This Sub-Committee deals with Electrical Accessories.

Under the heading: "Strategy Policy Statement", the scope was amended to read: "Standardization in the field of electrical accessories for use in and connected to electrical installations".

IEC TC 23.
This committee delegated all the specifications to sub-committees. The committee was looking at specifications for power track systems, EMC requirements for electrical accessories, sound signalling devices and some environmental aspects for these specifications. Mr Cohen reported that Mr Jim Toms (who had since retired) and himself had attended this committee's meeting.

IEC SC 23A.
This committee responsible for conduits had produced IEC 60614 – aweiwa, rhw 61035 series and the IEC 61084, all of which had been adopted locally. They had recently produced IEC 61386 – 1, which also deals with conduits. The Chairman had sent an e-mail to the convenor of the WG dealing with IEC 61386 to determine how the two documents existed next to each other. The convenor then stated that in the past, there were the IEC and CENELEC committees working in parallel with each other. The convenor stated that in the past there were the IEC and CENELEC committees working in parallel whereby the CENELEC produced EN 50086 – series dealing with conduits while the IEC produced the IEC 60614 – series and IEC 610035 – series. The WGs were then combined into a single WG to produce a four-part document, IEC 61386 which when completed, would replace all other conduit specifications. This sub committee had numbered the other parts, Part 21 (rigid conduit systems), Part 22 (pliable conduits) and Part 23 (flexible conduits), to get away from the triple digit spec numbering. The target dates for all these parts is the end of August 2001.

IEC SC 23B.
This sub committee had produced the IEC 60669 – series for switches and the IEC 60884 - series for plugs and sockets, which had already been adopted locally. The committee was working on addition 4 to IEC 60669 – 2 – 1 and IEC 60670 (outlet boxes) which would be divided into Part 1, Part 21, Part 22, Part 23 and Part 25. It is envisaged that this sub committee would co-ordinate with IEC SC 23 E, IEC 23 F and IEC SC 17 D to revise IEC 60670.

- **7 March 2001 : SC 67D Meeting : Japie de Villiers.**

This Sub-Committee deals with Insulators.

The membership of the organizations was considered and they were given the opportunity to change membership from 'P' to 'O' if they so desired. The AMEU remains a 'P' member.

The following international committees came under the spotlight::-
IEC TC36 Insulators; IEC SC 36A Insulated Bushings; IEC SC36B Insulators for Overhead Lines; IEC SC36Cinsulators for Substations and IEC TC42 High-Voltage Testing Techniques.

The following Standards were quoted as having been revised:-
SABS 1371; SABS IEC 60137; SABS IEC 60372; SABS IEC 603837; SABS IEC 61264; SABS IEC 61284 and SABS IEC 61462.

- **14 March 2001 : TC 62 : Vinod Patel.**

This Technical Committee deals with Electrical Measurements.

The following matters were dealt with: -
The STS specification for pre-payment token encryption methodology etc has been submitted to the IEC for approval and acceptance.

IEC 61036 has been amended and copies are now available.

Pre-payment System:
NRS 1524 – Part 0: Definition for pre-payment system needs revision.
Part 1: Will incorporate the mounting details and terminal layout for pre-payment meters.
Part 2: Will be withdrawn after incorporation into Part 1.

SABS 1816 is complete and will be issued for comments.

NRS 057 Part 1 and 2 will be issued for comment during this year.

- **16 May 2001 : SC 67A Meeting : Leon Fourie for Hannes Roos.**

The Technical Committee deals with HV Switchgear.

A number of amendments were published during the past year:
- SABS IEC 60050 (441) Amendment 1
- SABS IEC 60265 Amendment 4
- SABS IEC 60298 Edition 2.1
- SABS IEC 61243-1 Edition 2.1
- SABS IEC 61243-2 Edition 3.1
- SABS IEC 61243-3 Amendment 1.

Under 'Programme of Work', the following information was received:-
Once SABS 1874 (NRS 006) and SABS 1885 (NRS 003) are published, the NRS specifications would be withdrawn.

Both SABS 1874 and SABS 1885 referred to NRS 012 but NRS 012 had not been published and could therefore not be referred to. The committee AGREED to include an extract from NRS 012 in both SABS 1874 and 1885. There

was a proposal to change the title of SABS 1885 from "metal-clad" to "metal-enclosed" switchgear, but because of written comments in this regard, the committee retained SABS 1885's title as "metal-clad".

SABS IEC 61481
IEC had published the first edition of this specification. The committee AGREED to adopt this specification and the responsibility thereof would be transferred to SC 67 E with a recommendation that it be a 'mark' specification.

Under the heading 'General' two items of note can be quoted.

Withdrawal of standards.
In future, when a standard is withdrawn, an announcement will be made on the SABS Website and in the SABS Bulletin for 60 days before the standard is withdrawn.

E-mail.
The SABS is going completely electronic. All future correspondence will be through e-mail. It is therefore, important for the members to ensure that the Secretariat had their correct e-mail addresses and that changes should always be brought to the attention of the Secretariat.

- **23 May 2001 : TC 73 Meeting : Japie de Villiers.**

This Technical Committee deals with Electromagnetic Compatibility.

The purpose of the committee is standardization in the field of Electromagnetic Compatibility, which includes emission and immunity.

The SABS TC 71.3 Committee was established in July 1991 to provide, maintain and co-ordinate standards in the field of electromagnetic compatibility. The number of the committee was changed to SABS TC 73 in October 1998.

The scope and environment which the committee works were discussed thoroughly and a decision was taken to leave it unchanged. The various working groups then reported back on progress and new issues.

Working Group 1: Immunity and Emission Standards Testing (Convenor: L de Vries-Venter). Nothing to report. The Group will re-activate when needed.

Working Group 4: Broadcasting Interference (Convenor: A Koffeman). No report was given.

Working Group 5: Human Exposure to Non-Ionizing Radiation (Convenor: E Winter). An extensive report was given regarding the last international meeting held in St Petersburg in Russia. Interesting documentation used in New Zealand and Australia will be forwarded to committee members.

Working Group 6: EMC in Telecommunications (Convenor: J Botha). Nothing to report.

Working Group 7: Immunity of Personal Medical Equipment (Convenor: G Jansen). A well-prepared report was given regarding the immunity of cardiac pacemakers. The study revealed that this field is thoroughly covered by existing European and American standards and since there are no manufacturers of cardiac pacemakers in South Africa, there is no need to adopt these standards as South African standards.

This Working Group will now investigate the effect of electric wheelchairs on patients with multiple sclerosis. This report will tabled at the next meeting of TC 73.

- **30 May 2001: SC 67B Meeting: Leon Fourie for Hannes Roos.**

This Sub-Committee deals with LV Swithgear.
(No report available as at 10 July 2001).

- **20 June 2001: TC 66 Meeting: Japie de Villiers.**

This Technical Committee deals with Electrical Cables.

Discussions took place on the Strategic Policy Statement.

International Liaison:
Mr KW Leeburn reported on IEC TC 16 and stated that the next meeting will be held in South Africa.

Mr A Falconer reported on the committee work for IEC TC 18 and said that this work is linked to IEC TC 89.

The AMEU Reprsentative on the Local Committees is Mr JD de Villiers, who serves on Working Groups 16, 17 and 18.

The following Standards have been published:-
SABS 175 is withdrawn; SABS 1507 has been amended; VC 8006 is still in draft brm; and SABS 0198-14 is re-affirmed.

Under the 'programme of work' it is noted that SABS 1339 is now available; and on the issue of 'imported cables' a compulsory specification is envisaged and this aspect will be regulated with effect from next year. Steps such as the imports to be stopped at Customs; cannot be sold unless a letter of authority is available; SABS mark on cable to be installed.

Appointment of an AMEU Representative required on the Working Group for SABS 0198. This WG deals with the selection, handling and installation of electric power cables of rating not exceeding 33kV. The Technical Secretary has in the meantime requested Mr Japie de Villiers to fill this role as he is in any event the main representative on Cables. The Executive Council needs to condone this step if it approves.

RECOMMENDATION:

a) That the Executive Council note the contents of the report.

b) That the report be included in the Agenda for the AMEU Convention in October 2001.

c) That the Branches and the AMEU delegates to the 2001 Convention note the contents.

Al Fortmann.

Technical Secretary.

COMMITTEE REPORTS TARIFF COMMITTEE
P E Fowles (Chairman)

COMMITTEE MEMBERS

P E Fowles
J G Louw
D E T Potgieter
D J van Wyk
H Barnard (Affiliate)
D Conradie (Eskom Representative)
C Visagie (Eskom Representative)
L van Staden (Eskom Representative)
J P Venter (General Secretary)
M P P Clarke (Publicity Secretary)
A H L Fortmann (Technical Secretary

The Executive Council formed the Tariff Committee early in 2001. It was tasked with investigating and debating a wide range of tariff issues in order to develop policies and official stances that the AMEU can present to other bodies, such as SALGA and the NER. At its first meeting, members resolved that three Eskom representatives be coopted onto the Committee in order to provide input on the various issues and to form common stances with Eskom where appropriate.

Some of the more important issues that have received attention are:

- *Wholesale Electricity Pricing System (WEPS)*
  This contentious issue has been the subject of discussion for some considerable time with little progress toward a firm implementation date for qualifying customers. Eskom conducted a workshop during March 2001 to present the WEPS and debate issues relating to implementation. A further meeting took place during July 2001 between Eskom and AMEU tariff experts to discuss more of the WEPS technical issues. As a result, a WEPs Pilot Project has been introduced involving 'dummy' bills for eleven distributors. The committee has also now established a small workgroup to formulate a plan for the convergence of retail tariffs in South Africa in preparation for the establishment of Regional Electricity Distributors (REDs).

- *Electricity Basic Support Services Tariff (EBSST)*
  Commonly known as the 'poverty tariff', this issue has been of concern to the AMEU and Eskom. In order to assist the national EBSST Task Team, guidelines for distributors wishing to introduce a free allocation of electricity have been drafted by a team of AMEU and Eskom representatives chaired by Howard Whitehead.

- *Eskom 'Boiler Tariff'*
  This issue has been the subject of considerable discussion following dissatisfaction with its implementation by a number of AMEU members. Eskom have provided assurances that the tariff provides for interruptibility and the low costs are based on the use of surplus energy during standard and off-peak hours. The Committee suggested that Eskom submit the tariff for approval by the NER who should pay attention to fairness and consistency with respect to other tariffs which may or may not be interruptible.

- *Eskom Retail Tariff Plan 2002*
  Eskom's retail tariff plan for 2002 was presented to the Committee prior to Eskom conducting presentations to AMEU members in the Regions. Support was expressed by the Committee for the structural changes incorporated in the plan, especially:

- the redesign of all tariffs based on the WEPS as an input cost;
- the increase in voltage differentials to allow for a continuation of the move toward greater cost reflectivity.

It is noted that the NER have approved Eskom's proposed 2002 plan in principle. The proposal has now been promulgated for comment prior to final NER consideration.

ELECTRICITY BASIC SUPPORT SERVICES TARIFF (EBSST) TASK TEAM

P E Fowles, SALGA Representative

Prior to the municipal elections held during December 2000, announcements were made to the effect that a free basic allocation of essential services would, in due course, be made to poor households in South Africa. The Department of Minerals and Energy (DME) responded by establishing an Electricity Basic Support Services Tariff (EBSST) Task Team to manage the free allocation of electricity.

The Task Team first met in February 2001 with a mandate from Government to plan for the implementation of the free allocation by considering all relevant issues, conducting a number of pilot projects and making suitable recommendations for Cabinet to consider by March 2002. The intention from this mandate has always been to plan for a phased implementation. The SALGA representatives on the Task Team have been P E Fowles and D E T Potgieter. Other stakeholders represented are Eskom, National Treasury, NER, Department of Provincial and Local Government and Department of Water Affairs.

Subsequent announcements by several Metro and Local Councils that they were to implement a free basic allocation of electricity has thrown some doubt on the need for the EBSST. This uncertainty has been exacerbated by the call for guidelines from some Municipalities on implementing a free basic allocation of electricity.

In view of the urgent need for such a document guideline, a draft document being produced by the Task Team was taken by a group of AMEU and Eskom representatives, chaired by Howard Whitehead, and refined. The status of this guideline is that it is still not an official document and will only become one once the pilots have been completed and Cabinet have approved the Task Team's recommendations.

The experience of a number of municipalities that have chosen to implement a free allocation will, no doubt, be used to formulate the final recommendation. Key issues still to be resolved are the number of units (kWh) that will be provided, to whom and the source of the funding.

COMMITTEE REPORTS

FINANCE COMMITTEE
P E Fowles (Chairman)

COMMITTEE MEMBERS

P E Fowles
Clr F M X Grantham
J D Algera
H A Auret
T Hill
D E T Potgieter
P J S van Niekerk
J P Venter (General Secretary)
M P P Clarke (Publicity Secretary)
A H L Fortmann (Technical Secretary)

Mr Algera retired and Mr Hill resigned from Municipal service during the period of this report.

MEETINGS

The Committee held six meetings since the last AMEU Convention in Bloemfontein. The task of the Committee is to consider all financial matters affecting the AMEU and to make suitable recommendations for consideration by the Executive Council. Some of the more important issues dealt with over the last two years are highlighted below:

ISSUES

- **Revised fee structure**

Due to the expected uncertainty during the early part of 2001, subscription invoices relating to the pre-restructuring membership were sent out during September 2000. An appeal to members to pay these subscription fees early to ensure that the expected income was received produced a positive response.

An analysis of the probable effects of the municipal demarcation process on AMEU members, and the associated membership fee income, led to the adoption of an amended fee structure to be introduced with effect from the 2002 calendar year.

The revised fee structure provides for the consolidation of member undertakings and was designed to ensure that, as far as is possible, the income from membership fees remains at a level to meet the AMEU operating expenditure.

- **Budgets**

An abridged version of the statements indicating the financial performance of the Association for the years 1999 and 2000 is shown below. The committee continues to closely monitor income and expenditure and a budget for 2001 has been prepared for consideration by the new Executive Council. Members have already been advised of the fee structure for 2002 to enable the amounts to be included in 2001/2002 budgets.

- **Investments**

Due to the uncertainty prevailing in equity markets from early in 2001, a decision was taken to liquidate the Association's investments on the JSE in a controlled manner. The situation will be closely monitored to assess when it may be advantageous to reinvest AMEU funds in shares.

ACKNOWLEDGEMENTS

The considerable contribution of committee members and the dedicated and professional handling of our financial affairs by Jean Venter and his team is gratefully acknowledged. Al Fortmann remained with the AMEU as our Technical Secretary following his retirement in 1999 and, together with Max Clarke, continued to provide the committee with invaluable advice and support.

Our members have also made a significant contribution to the Association through the timeous payment of their membership fees, often under difficult circumstances. This support is gratefully acknowledged.

We acknowledge the help and support of our auditors, Messrs Harris, Dowden and Fontaine, our bankers First National Bank, Randburg, and all those who made a financial contribution to the many AMEU functions and activities around the country.

	1999	2000
	R	R
INCOME	**1 005 596**	**992 208**
Convention/Technical Meeting	329 489	333 915
Interest and Dividends	225 488	146 783
Membership fees	396 339	390 264
Newsletter receipts	53 655	74 662
Other	625	46 584
LESS EXPENSES	**910 963**	**1 108 071**

Newsletter/Proceedings (nett)	166 973	167 792
Convention/Technical Meeting	25 490	48 749
Administration	680 487	868 185
Student Assistance/Awards	38 013	23 345
NET SURPLUS (LOSS)	**94 633**	**(115 863)**
Accumulated funds at beginning of the year	2 565 545	2 660 178
TOTAL ACCUMULATED FUNDS	**2 660 178**	**2 544 315**

ELECTRIC AND MAGNETIC FIELDS B ACTIVITIES OF THE ELF-EMF PROGRAMME OF SOUTH AFRICA AND THE ELF-EMF PROGRAMME EXECUTIVE FOR THE PERIOD SEPTEMBER 1999 TO AUGUST 2001

Howard Whitehead and Tony Dold C Durban Metro Electricity

The ELF-EMF Programme falls under the umbrella of the South African Forum for Radiation Protection. The background and objectives have been covered in detail in previous reports, the last being published in the Proceedings of the AMEU Convention held in Bloemfontein in September 1999 (page 106).

The institutions represented on the executive are B

Faculty of Medicine, University of Stellenbosch
South African Forum for Radiation Protection
Directorate : Radiation Control, Department of Health
EMF Consultant
Faculty of Engineering, University of the Witwatersrand
Eskom
Medical Research Council
The Association of Municipal Electricity Undertakings : Southern Africa

During the period under review the Executive met only twice and one meeting was arranged in November 2000 to which all parties interested in the biological affects of Electric and Magnetic Fields were invited from around the country. The latter meeting included a presentation from an international specialist and was well attended. Mr Dold, Director : Transmission, represented the AMEU (Southern Africa) on all these occasions and can report that the Executive continues to follow local and international research and issues on this subject. In fact, the chairman participates in the World Health Organisation International EMF Project and he and others on the committee participated in several relevant international interactions.

It is considered that, during this period, the concern about the biological effects of Extremely Low Frequency (ELF B 0 to 300 Hz) magnetic fields has reduced considerably and the media has generally reflected that. For instance, the following are extracts from an article in Electricity UK (March 2001) B

Further evidence that children living near overhead power lines or underground cables face no additional risk of leukaemia or other cancers was welcomed by the Electricity Association late in 2000.

A study of nearly 7 000 children, half of whom had cancer, could find no evidence that the proximity of electricity installations, or the magnetic fields that are created near lines and cables, puts them at increased risk. The findings by the UK Childhood Cancer Study (UKCCS) complemented the results of a study one year earlier which examined exposure levels to magnetic radiation among more than 2 200 children.

Over 20 years and ,300 million of research have been dedicated to investigating possible risks to health from electromagnetic fields.

However, there have been other articles which, even though not widely supported by the specialists in this research field, continue to refer to the harmful effects, with electric fields again being given some attention as well as magnetic fields. The fact is that this issue has always been one where the public perception is most important and will not be easily resolved, particularly when some countries have tightened up on the allowable levels and are actively reducing or limiting the number of high voltage power lines, notwithstanding the research findings. If, for instance, litigation by protagonists anywhere in the world went in their favour, this may re-ignite public attention.

There has, however, been considerable worldwide attention given to the biological effects of the higher frequencies, with the focus being on cell phones. The Executive therefore resolved to extend the attention to this area as well and the >ELF= part of the designation has been dropped.

In conclusion, whilst the level of concern about the health effects of power line frequencies may have reduced significantly in scientific circles, it remains an issue to be monitored and it is recommended that the AMEU continues to be represented on the Executive of the EMF Programme.

With respect to exposure levels applicable to South Africa it is recommended that all efforts are made to design any line or cable system to minimise the electric and magnetic fields and certainly to be less than the following guidelines recommended by the Department of Health, being the regulatory authority in South Africa.

	Electric Field (V/m)	Magnetic Field (l T)
Continuous exposure	5 000	100
Short term exposure	10 000	1 000

REPORT OF THE GENERAL SECRETARY FOR THE PERIOD 1999–2001

JEAN VENTER

Your Association, now in its 86th year of existence, continues to play a strategic role in the electricity distribution industry. The Executive Council, the seven Committees of the Executive Council and numerous *ad hoc* committees have an extremely active two years behind them.

The past two years saw a further strengthening of several industry ties that were forged during the preceding two-year period. Close cooperation with the South African Local Government Association was further formalised when SALGA

mandated the AMEU Engineering Committee to act as its technical advisory body on electricity matters. During this period Messrs HR Whitehead and AJ van der Merwe served as Technical Representatives for SALGA.

During 2000, it became clear that various synergies were developing in terms of the AMEU and ESKOM positions on the restructuring of the industry. The Council deemed it prudent to forge closer links with Eskom. The so-called "Imberbe" meetings first held with Eskom in 1997 were re-established and will hopefully form part of the annual meeting schedule of the AMEU for some years to come.

The Council recognised that an increasing number of electricity tariff issues deserved closer attention. These included wholesale electricity pricing, the Eskom boiler tariff, voltage discounts and, lately, the Electricity Basic Social Support Tariff. The Council responded by establishing the AMEU Tariffs Committee.

Links with the STS Association have strengthened in that the AMEU representative to that body is now a full voting director of the association. The AMEU's 1997 initiative of establishing the South African Revenue Protection Association has seen SARPA grow to a fully fledged association, now attracting major audiences to its national and regional functions.

In its efforts to meet the training standardisation objectives of the Qualifications Act, the Training Committee initiated broad cooperation with Eskom and with the eight Municipal Training Centres around South Africa.

Toward the end of 2000, the work of the Demarcation Board culminated in a local government election, final activation of the national constitution, introduction of the Municipal Structures and Systems Acts, and a large reduction in the number of municipalities around South Africa. These changes will reduce the active number of municipal members to about 133 over the next 12 months.

Although broad consensus emerged on the need to restructure the electricity distribution sector, the *how, when* and *by whom* remained problematic over the past two years. The debates are complicated and the industry seems to be far from any kind of consensus on many of the critical restructuring issues. Electricity is at the same time a vital industrial and commercial commodity and a most important social service that will shape the future of the subcontinent. It is to be expected that changes to a 100-year-old industry that continues to perform in an exemplary manner will require exceptional levels of debate.

I must also report that your Council members invested exceptional amounts of time and effort in the activities of your association. The diligence displayed and the family times sacrificed are to the credit of both municipal electricity distribution and the electrical engineering profession.

It is my pleasure to submit this report on the activities of the AMEU over the past two years.

EXECUTIVE COUNCIL

AJ van der Merwe	-	Mangaung, President plus Councillor
JA Ehrich	-	Tshwane, President Elect plus Councillor

Together with their Councillor Members, who were nominated by their respective Councils, the following Engineer Members were elected tot the Executive Council at the 57th Convention held in Bloemfontein in 1999:

HA Auret	-	//Kara Hais
NF Croucher	-	Cape Town
GF Ferreira	-	Nelson Mandela
PE Fowles	-	Msunduzi
JG Louw	-	Cape Town
DET Potgieter	-	Polokwane
J Roos	-	Edenvale/Lethabong (Resigned 2000)
PJS van Niekerk	-	City Power

Pursuant to the Constitution, the following Past Presidents, together with their Councillors, were also members of the Executive Council:

JG Malan - Kempton Park (Resigned 2000)

HR Whitehead - Durban

HD Beck - Buffalo City

During this period the following persons acted as co-opted members of the Council:

TP van Niekerk	-	Chairman of the Affiliates Committee
T Hill	-	Kimberley
JD Algera	-	Rustenburg

Secretariat
JP Venter from Van der Walt & Company served as General Secretary to the Association.

Technical Secretary
AHL Fortmann served as Technical Secretary. He is a Past President and an Honorary Member of the Association.

Publicity Secretary
MPP Clarke served as Publicity Secretary. He is a past Executive Council Member and an Honorary Member of the Association.

Executive Council Meetings
The Executive Council held six meetings during the past two years.

BRANCHES
The AMEU Branches held regular meetings to discuss matters of mutual interest.

Office Bearers 2000/2001

BOSVELD SUB-BRANCH

Chairman	-	Pierre van den Heever
Vice-Chairman	-	William Olivier
Hon. Secretary	-	Hammies van der Merwe

EASTERN CAPE BRANCH

Chairman	-	David Michie
Vice-Chairman	-	Harden Beck
Secretary	-	Thinus Minnie

FREE STATE/NORTHERN CAPE

Chairman	-	Andries Swiegers
Vice-Chairman	-	Gerhard Meyer
Secretary	-	AJ van der Merwe

GOOD HOPE BRANCH

Chairman	-	Hugo Mostert
Vice-Chairman	-	Kevin Gru newalt
Secretary	-	Fred Daniel

HIGHVELD BRANCH

Chairman	-	Evert van Helden
Vice-Chairman	-	Gerhard Teunissen
Hon. Secretary	-	HJ van Wyk

MPUMALANGA SUB-BRANCH

Chairman	-	Raymond Grunig
Vice-Chairman	-	CD Dirks
Secretary	-	Jaco Landsberg

NATAL BRANCH

Chairman	-	DJ van Wyk
Vice-Chairman	-	Leon van der Merwe
Secretary	-	Bronwyn Farrel

COMMITTEES AND REPRESENTATIVES

The following committees and representatives were appointed by the Executive Council:

COMMITTEES

STANDING COMMITTEE

President (Chairman) plus councillor, President-Elect plus councillor, Immediate Past President, P J S van Niekerk, P E Fowles, HR Whitehead (SALGA) (Co-opted)

LEGAL AND STATUTORY REGULATIONS COMMITTEE

N F Croucher (Chairman), G F Ferreira, J G Louw

ENGINEERING COMMITTEE

J A Ehrich (Chairman), J D H A Auret, H D Beck, N F Croucher, G F Ferreira, P E Fowles, J G Louw, D E T Potgieter, P J S van Niekerk, H R Whitehead

FINANCE COMMITTEE

P E Fowles (Chairman) plus councillor, H A Auret, D E T Potgieter, P J S van Niekerk

PAPERS COMMITTEE

President (Chairman), President-Elect, Immediate Past President, Chairperson & Vice Chairperson of the AMEU Affiliates Committee, Councillor from host city or town,
City/Town Electrical Engineer from host city/town

PUBLICITY AND TRAINING COMMITTEE

J G Louw (Chairman), N F Croucher, G F Ferreira, P E Fowles, P J S van Niekerk,
H R Whitehead, Executive Council Members with Training Centres

TARIFF COMMITTEE

P E Fowles (Chairman), J G Louw, D E T Potgieter, D van Wyk, H Barnard

REPRESENTATIVES

ECSA: ENGINEERING COUNCIL OF SOUTH AFRICA (Tariffs and Fees Forum)

President, President-Elect (Alternate)

EMF: ELECTRIC & MAGNETIC FIELDS FORUM

H R Whitehead (or his nominee)

EPCC: ELECTRIC POWER CO-ORDINATING COMMITTEE
P J S van Niekerk (responsible for reporting), J G Louw (Alternate)

ESLC: ELECTRICITY SUPPLIERS LIAISON COMMITTEE
City Electrical Engineer of the following cities: Tshwane, Mangaung, Cape Town, Durban, City Power, Nelson Mandela, & A H L Fortmann (Technical Secretary)

MUNICIPAL ASSOCIATIONS
SALGA – H R Whitehead
Provincial Associations: Engineer Members as nominated by Provincial LG Associations

NATIONAL TECHNICAL COMMITTEE NTC 76 (ISO 9000)
J A Ehrich, A H L Fortmann

POWER INSTITUTE OF EAST AND SOUTHERN AFRICA (PIESA)
A J van der Merwe, P E Fowles, A Smuts, A J Dold, F Erasmus, M Wilson

SANCI
T Hill

S A NATIONAL COMMITTEE OF THE IEC
President

SOUTH AFRICAN NATIONAL ENERGY ASSOCIATION
J A Ehrich

SOUTH AFRICAN REVENUE PROTECTION ASSOCIATION (SARPA)
PE Fowles & JG Louw

STAKEHOLDERS ADVISORY COMMITTEE (DME)
J A Ehrich, H D Beck

SABS
AMEU members serve on some 15 technical committees of the SABS.

MEMBERS MEETINGS

Convention
The 56th Convention was held in Bloemfontein in September 1999 and was attended by 543 delegates, guests and companions.

Technical Meeting
The 18th Technical Meeting was held in Mossel Bay in September 2000 and was attended by 538 delegates, guests and companions.

Papers
Papers presented to the Convention and Technical Meeting were printed in the Proceedings, which were posted to all members and delegates.

Sponsors
On behalf of the AMEU we wish to record our sincere thanks and appreciation to all Affiliate Members who sponsored advertisements in the proceedings as well as for sponsoring the various social functions at these meetings.

Affiliates
The Affiliates held regular meetings, under the able chairmanship of Mr Trevor van Niekerk. The Affiliates now participate in the activities of all Branches of the Association and their contribution to building the Association is greatly appreciated.

MEMBERSHIP
The membership figures for the AMEU are as follows:

	1997	1999	2001
Honorary Members	36	36	30
Past Members	50	47	48
Engineer Members	225	215	202
Associate Members	39	38	86
Local Authorities	225	215	133
Affiliate Members	170	145	159
Total membership	745	696	658

Honorary Membership
Mr Jan Malan was granted Honorary Membership of the AMEU at the 56th Convention held in Bloemfontein in September 1999.

Certificates of Merit
The Mossel Bay Technical Meeting did not award any certificates of merit.

Obituary
Since the 18th Technical Meeting held in Mossel Bay, the following members or colleagues have passed away:

Mr Gawie Theron - Honorary Member / Past President
Mr GS de Vries - Retired Member
Mr F Turnbull – Retired Member
Ms Judy Banwell – Late Secretary of Kwazulu-Natal Branch
Ms Daizy Wortmann
Mr John Bradbury
Ms Nadia Davids

Conclusion
This report should be read in conjunction with the reports of the Association's various committees and/or representatives. The AMEU appreciates the time and energy spent on committee activities by the chairmen and members. 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 this selfless service.

AMEU
Association of Municipal Electricity Undertakings (Southern Africa)

- Objectives
- Mission
- Credo
- Undertaking Membership
- Affiliate Membership
- Non-South African Undertaking Members
- Committee Structure of the AMEU
- Branch Structure
- Communication
- Operational and Historic Overview

Assuring Quality Electricity to South Africa

Objectives of the AMEU

- To promote quality of service of electricity supply;
- To facilitate communication and liaison between all members in the technical, economic & political environment;
- To provide advisory service to members & customers;
- To organise conferences and workshops, creating forums to promote technical excellence in the electrical industry

Mission

To promote the pursuance of *quality of service and management excellence* of its members.

- *To communicate & liaise with the technical, economic and political environment to positively influence that environment.*
- *To provide an advisory service to its members and Local Government.*
- *To serve the interest of the members who are all suppliers of electrical energy to all categories of customers throughout Southern Africa.*

Credo

- The members of the AMEU are committed to supply our existing and future customers with electrical energy of acceptable quality to meet their needs.
- In the interests of our customers we are committed to follow excellent standards of management & pursue our activities with integrity.
- Within the constraints imposed upon municipal electricity distributors, we endeavour to provide our customers with a product that provides value for money.
- We are ever mindful of the impact that our service has on the environment and strive to maximise any benefit and minimise any detrimental effect.
- To benefit our customers and the environment we strive to implement innovative engineering techniques

Undertaking Members

The South African Constitution grants executive authority and the right to administer electricity distribution, within Municipal boundaries to Municipalities.

Some Municipalities distribute electricity and some may use a service provider to provide the services. Either way, the responsibility is with the Council. This responsibility extends to making sure that the community is served with quality electricity. Electricity Distribution may even be a source of revenue for the funding of other services - even if your council uses a third party to do the distribution.

Joining the AMEU will make your Council part of the family of electricity service undertaking authorities and will broaden your insights and capacitate your council to execute its Constitutional duties with a broader perspective on the industry. If you do distribute your own electricity, then engineering staff will find the forums of the AMEU of great technical value.

Our publications, exhibitions and close co-operation with the manufacturing industry, will also broaden knowledge on the products and services available to service authorities and providers.

Affiliate Members

Affiliate members of the AMEU are companies or organisations offering services or products to the electricity distribution industry.

Affiliate membership offer such members the opportunity to network widely with strategic decision makers in electricity distribution undertakings.

In addition, affiliates are active participants in our annual Congress or Technical meetings as exhibitors at no charge, if you have been a member for more than one year. Exhibition space is also available at some branch meetings.

The affiliates committee co-ordinates affiliate's interaction at the various AMEU events. These include the sport day at every convention or technical meeting, branch meetings and the annual affiliates golf day.

The AMEU Affiliates jointly with Eskom organises Applitec, a technical information conference aimed at electricity undertaking middle management staff.

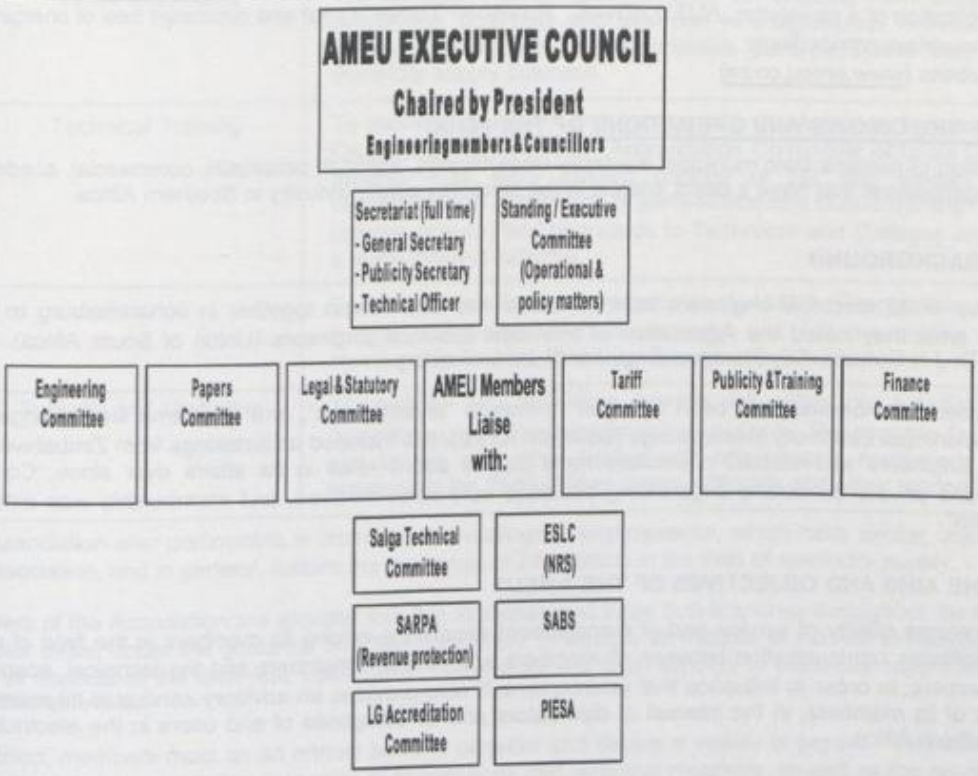
UNDERTAKING MEMBERS NOT RESIDENT IN SOUTH AFRICA

The AMEU constitution provides for electricity distribution organisations from outside of South Africa to join the AMEU.

Membership benefits include close contact with the South African electrical equipment and manufacturing fraternity at our congresses and technical meetings and receiving the AMEU NEWS, containing relevant technical and management information relevant to this continent.

You will also benefit from strategic liaison with AMEU member who are also suppliers of electricity.

Committee structure of the AMEU



Executive Council Composition

The AMEU Convention elects eight electrical Engineer Members on a bi-annual basis to serve on the Executive Council. The Council also includes the President and President elect as well as serving Past Presidents. The City or Town Council of each of the Engineer Members on the Council then nominates a Councillor to the Executive Council. The full council is therefore made up of an equal number of Electrical Engineers and Municipal Council representatives. At each Convention the Members elect a President Elect, who will two years later take over as President of the Association.

Branch Structures

- Highveld Branch covering Gauteng, Mpumalanga, Northern Province, North West & neighbouring states.
- Bushveld Sub-Branch – Northern Province
- Mpumalanga Sub-Branch
- Freestate & Northern Cape Branch
- KwaZulu-Natal Branch
- Eastern Cape Branch
- Good Hope Branch covering the Western Cape & Namibia

Communication

- Executive decisions are conveyed through circular letters;
- Representatives on the Executive Committee report back at branch meetings;

- Publication of a newsletter, AMEU NEWS. Published 3 times a year and circulated free of charge;
- Convention proceedings.
- Website (www.ameu.co.za)
-

OVERVIEW OF THE ORIGINS AND OPERATIONS OF THE AMEU

It is an association of persons from municipal electricity undertakings, national, parastatal, commercial, academic and other similar organisations that have a direct interest in the electricity supply industry in Southern Africa.

HISTORICAL BACKGROUND

In 1915 a group of 22 electrical engineers from 17 towns and cities came together in Johannesburg to adopt a constitution for what they called the Association of Municipal Electrical Engineers (Union of South Africa). The first President was Dr J H Dobson, City Electrical Engineer of Johannesburg.

Within a few years membership had been changed to include "undertakings", and the name was changed to the Association of Municipal Electricity Undertakings (Southern Africa), this included undertakings from Zimbabwe, Zambia and Namibia. Engineers and elected councillors have played active roles in its affairs ever since. Commercial organisations and private consulting engineering practices were soon involved, and membership was extended to include "affiliates".

WHAT ARE THE AIMS AND OBJECTIVES OF THE AMEU?

The AMEU promotes quality of service and of management excellence among its members in the field of electricity supply, and facilitates communication between all members and between members and the technical, economic and political environment, in order to influence that environment. It also provides an advisory service to its members and the customers of its members, in the interest of distributors and all categories of end users in the electricity supply industry in Southern Africa.

HOW DOES THE AMEU OPERATE?

The day-to-day activities of the Association are taken care of by a full-time Secretariat under the guidance of a President and Executive Council, who are elected by the members every two years.

The members of the Executive Council serve on various specialist sub-committees which are dedicated to such matters as electricity supply, education and training, finance, product authorisation, publicity and such ad-hoc committees as are required from time to time to address specific matters. They also serve on specialist committees of the SABS, ESLC (NRS) and other statutory bodies as required, and in many cases are assisted by non-council members of the Association who have a special interest or knowledge of a particular subject under review.

The Sub-committees of the Executive Council are:

Engineering Committee	Focuses primarily on technical and engineering aspects in the EDI. These include issues in the technical and political environment of distribution. Amongst others issues related to restructuring of the EDI, NER related matters, SABS, tariffs and tariff policy, technical standardisation, ESKOM liaison, SALGA etc.
Papers Committee	Functions are to arrange forthcoming conventions and technical meetings. Select and evaluate papers for these conferences. Liaise with affiliates and host city with secretariat to ensure success of conference.
Legal & Statutory	Takes care of changing legislation and ensure input from AMEU. Focus areas are bylaws, Occupational Health and Safety Act, Electricity Act and other related legislation having a bearing on electricity supplies. The committee will initiate and comment on changes.

Tariffs Committee	The committee is designated to be an ongoing committee tasked to investigate, contribute and take part in a continuous manner on issues relating to tariffs, both on the wholesale (purchases) and retail side of the electricity supply business.
Technical Training	To promote education and training with the focus on technical training. Committee liaises with the Accreditation Committee of Local Government training - all eight training centres of LG and Eskom. Promotes standardisation in curricula of semi-skilled and skilled training. Committee initiates annual Fiat Lux awards to Technikon and Colleges and operates a study initiative scheme.
Finance	To oversee all financial operations of AMEU. Responsible for annual budget statements and investments and for the setting of annual membership fees and conference registration costs.
Publicity and Marketing	All publicity and marketing aspects fall within the jurisdiction of this committee under direct leadership of publicity. Responsible for marketing and liaison with other bodies with reference to marketing. Secretary responsible for AMEU News, press editorials and other related issues.

The Association also participates in international meetings of organisations, which have similar objectives to those of the Association, and in general, fosters the exchange of information in the field of electricity supply.

Members of the Association are grouped into five Branches and three Sub-branches throughout the RSA and meet on a regular basis, under the guidance of a local chairman, to discuss all matters of interest to members. The subjects cover all aspects of the technical, operational, managerial and legal aspects of electricity supply affecting both local and national levels.

In addition, members meet on an annual basis to consider and debate a variety of papers - selected to cover current, relevant subjects presented to delegates at conventions and technical meetings, as well as the reports on the work of technical and specialist national committees on which members serve from time to time.

Affiliate members of the Association are drawn from commercial and private sector organisations and in turn operate under an elected chairman and committee who liaise closely with the Secretariat and Executive Council at all times. Members meet regularly at general meetings where their activities and contributions are planned, and decisions are taken on relevant matters. The Association charges a nominal membership fee to cover the costs of its many activities.

HOW DOES THE AMEU COMMUNICATE/SERVE ITS MEMBERS?

In various ways; *firstly*, all crucial information arising from decisions of the Executive Council is conveyed immediately to members in appropriate circular letters from the Secretariat.

Secondly, representatives from each branch serve on the Executive Council and are required to attend branch meetings to report directly on activities and decisions of the Council, and to report back to the Council on important matters debated by the branches which are likely to impact on all members of the Association, which are policy decisions at a national level.

Thirdly, by publication of a newsletter, AMEU NEWS, carrying information on Association activities, policies, personalities and important projects being undertaken by individual members, which are judged to be of interest to other members by virtue of their technical, conceptual, financial and/or managerial aspects and also news of new products and technical developments that have reached the market place. AMEU NEWS is published three times a year and carries a limited amount of direct advertising. It is circulated free of charge to all members and to a selection of other important readers having a direct interest in the industry.

Fourthly, by distribution of a compilation of all the presented papers and reports, including the debate which takes place, from each annual meeting of the association. These "Proceedings" are sent to all members and are also made

available to interested outside parties at a small fee. The Proceedings also carry a limited amount of product and company advertising.

WHAT PART DO THE AFFILIATES PLAY?

Networking and social interaction forms an important part of the AMEU's activities. The Affiliates play a leading role in the facilitation of functions and meetings of the AMEU.

Affiliate members attend branch and national meetings of the Association where they contribute to the general discussions during the proceedings, or they deliver an address on a particular subject or product when suitable arrangements have been made in the programme. At many regional and national meetings the affiliates organise appropriate exhibitions or demonstrations where equipment and products are shown to members, and business contacts established. The Affiliate Members also organise an annual conference, in co-operation with Eskom, dedicated to the proper application of new and existing technologies in the electricity-supply field.

Association of Municipal Electricity Undertakings (Southern Africa)
General Secretaries: Van der Walt & Co
PO Box 868, Ferndale, 2160, Republic of South Africa
Fax: +27 11 789-1385
Tel: +27 11 789-1384
e-mail ameu@vdw.co.za
web: www.ameu.co.za

UNDERTAKING MEMBERS

City/Town	Engineer Member Tel/Fax	Address
//Khara Hais	Mnr LA Bosch (051) 653-7777 (051)653-0056	Posbus 13 BURGERSDORP 5520
Abaqulusi	Mr K Tupper (034) 982-2947 (034)980-8822	P O Box 57 VRYHEID 3100
Ba-Phalaborwa	Mr JI Ten Cate (015)780-6300 (015)781-0726	P O Box 67 PHALABORWA 1390
Bela Bela	Mr VJ de Souza (014)736-2111 (014)736-3288	Private Bag X1609 WARMBAD 0480
Bergrivier	Mr G Lucas (022)783-1112 (022)783-1422	P O Box 29 VELDRIF 7365
Boesmanland	Mr P Boltman (054)933-0066 (054)933-0252	P O Box 108 POFADDER 8890
Buffalo City	Mr HD Beck (043)705-9601 (043)748-3748	P O Box 2001 BEACON BAY 5205
C.T. Blaauwberg Admin	Mnr JJ Hattingh (021)400-3864 (021)425-2293	Posbus 35 MILNERTON 7435
C.T.Oostenberg Admin	Mr HD Mostert (021) 900- 569 (021)900-1559	Private Bag X16 KUILSRIVIER 7579
Camdeboo	Mr MP Minnie (049) 892-2121 (049)892-4319	P O Box 71 GRAAFF-REINET 6280
Bergriver	Mr N Rossouw (022)913-1126 (022)913-1380	P O Box 60 PIKETBERG 7320
City of Cape Town	Mr NF Croucher (021)400-2500 (021)421-5088	P O Box 82 CAPE TOWN 8000
Dan-Lime	Mr JH van Wyk (053) 384-0013 (053)384-0326	P O Box 43 DANIELSKUIL 8405
Dihlabeng	Mnr P Potgieter (058)303-5732 (058)303-4703	P O Box 551 BETHLEHEM 9700
Drakenstein	Mr JE Coetzee (021)871-1911 (021)872-4074	P O Box 12 PAARL 7620
Ekurhuleni Eastern Admin	Mr MJ Wilson (011) 899-4029 (011)892-4806	P O Box 215 BOKSBURG 1460
Ekurhuleni Southern Admin	Mr MJ Wilson (011) 899-4029 (011)892-4806	P O Box 215 BOKSBURG 1460

City/Town	Engineer Member Tel/Fax	Address
//Khara Hais	Mr HA Auret (054)332-5911 (054)331-2909	Private Bag X6003 UPINGTON 8800
Amahlati	Mr JC Moerdyk (043)683-1100 (043)683-1127	Private Bag X2 STUTTERHEIM 4930
Beaufort Wes	Mnr R van Staden (023)415-2121 (023)415-2811	Privaat Sak 582 BEAUFORT WES 6970
Bergriver	Mr JJ Erasmus (022)931-2100/2101 (022)931-3047	P O Box 50 PORTERVILLE 6810
Blue Crane Route	Mr DW Jordaan (042)243-1333 (042)243-1548	P O Box 21 SOMERSET EAST 5850
Breede Valley	The Electrical Engineer (023)348-2647 (023)347-2599	Private Bag X3046 WORCESTER 6850
Buffalo City	Mr P Harpestad (040)639-2061 (040)639-2075	P O Box 124 BISHO 5608
C.T. Helderberg Admin	Mr A van Dijk (021)400-5561 (021)400-5913	P O Box 82 CAPE TOWN 8000
C.T.Tygerberg Admin	Mr JG Louw (021)400-2610 (021)400-5913	P O Box 82 CAPE TOWN 8000
Cape Agulhas	Mr F Bussell (028)425-1919 (028)425-1019	P.O. Box 51 BREDASDORP 7280
Cental	Mr PJS van Niekerk (09230)601 1100 (09230)675-5090	P O Box 40 Curepipe Mauritius
City Power JHB	Mr MK Mohlala (011)490-7307 (011)490-7377	P O Box 38766 BOOYSENS 2016
Delmas	Mr L Niewenhuizen (013)665-6000 (013)665-2913	P O Box 6 DELMAS 2210
Drakenstein	Mr JA Venter (021)873-1121 (021)873-2524	P O Box 12 WELLINGTON 7655
E.C Prov Admin	Mr A Didloff (041)390-4167 (041)390-4177	Private Bag X6005 PORT ELIZABETH 6000
Ekurhuleni Northern Admin	Mr MJ de Villiers (011)899-4023 (011)899-4169	P O Box 4 ALBERTON 1450
Emalahleni	MR JA B otha (013)690-6400 (013)690-6237	P O Box 3 WITBANK 1035

Mbombela	Mr P Fourie (013)751-1176 (013)751-2667	P O Box 2 WITRIVIER 1240
Emfuleni	Mr M Tshabalala (016)450-5465 (016)455-4522	P O Box 3 VANDERBIJLPARK 1900
Emthamjeni	Mr A Zwiegers (053)631-0927 (053)631-1518	P O Box 42 DE AAR 7000
eThekwini	Mr HR Whitehead (031)300-1000 (031)306-3196	P O Box 147 DURBAN 4000
Gariep	Mr F Joubert (048)884-0034 (048)884-0386	Private Bag X4 STEYNSBURG 5920
Gobabis	The Electrical Engineer (09264) 681-2551 (09264) 681-3012	P.O. BOX 33 GOBABIS NAMIBIA
Greater Kokstad	Mr D Barker (039)727-2625/2298 (039)727-4321	P O Box 8 KOKSTAD 4700
Greater Tzaneen	Mr P van den Heever (015)307-8160 (015)307-8049	P O Box 24 TZANEEN 0850
Highveld East	Mr CD Dirks (017)620-6062 (017)634-1126	Private Bag X1017 SECUNDA 2302
Kai ! Garib	Mr MW Clarke (054)431-6300 (054)431-6301	P O Box 174 KAKAMAS 8870
Kai !Garib	Mr AJP Wells (054)461-6400 (054)461-6401	P O Box 8 KEIMOES 8860
Kareeberg	Mr JM Klem 02032-12 02032 VRA 142	P O Box 10 CARNARVON 7060
Kimberley	Mr CH Schoeman (053)830-9529 (053)831-2904	Private Bag X5005 KIMBERLEY 8300
Klerksdorp	Mr LH Strydom (018)473-1451 (018)473-3364	Private Bag X8 ORKNEY 2620
Klerksdorp	Mr W Viljoen (018)462-9851 (018)464-1221	Private bag X99 KLERKSDORP 2570
Kopanong	Mr B Buitenbach (051)743-1658 ASK FOR FAX NO	Private Bag X16 EDENBURG 9908
Kouga	Mr AH du Plessis (042)391-1111 (042)353-1114	P O Box 21 JEFFREYSBAAI 6330
Kuruman-Mothibastad	Mr T Pretorius (053)712-1095 (053)712-3581	P O Box 4 KURUMAN 8460
Kwadukuza	Mr J Hall (032)946-8005	P O Box 5 BALLITO 4420
Emalahleni	Mr JA Botha (017)648-2241 (017)648-4764	Private Bag X5014 KRIEL 2271
Emnambithi	Mr W Albertyn (036)637-6905 (036)637-2592	P O Box 56 LADYSMITH 3370
Endumeni	Mr L van der Merwe (034)212-2121 (034)212-3856	Private Bag X2024 DUNDEE 3000
Gariep	Mr JW Visser (051)654-0224 (051)654-0374	Private Bag X2 VENTERSTAD 9798
George	Mr K Grunewald (044)874-3917 (044)874-3936	P O Box 19 GEORGE 6530
Great Kei	The Electrical Engineer (043)831-1028 (043)831-1306	P O Box 21 KOMGA 4950
Greater Marble Hall	Mr JL Durie (013)261-1151 (013)261-2985	P O Box 111 MARBLE HALL 0450
Hibiscus Coast	The Electrical Engineer (039)682-1100 (039)682-1131	P O Box 5 PORT SHEPSTONE 4240
Inxuba Yethemba	Mr MJC Roodt (048)881-1515 (048)881-1421	P O Box 24 CRADOCK 5880
Kai !Garib	The Electrical Engineer (054)651-6500 (054)651-6501	Private Bag X05 KENHARDT 8900
Kannaland	Mr WK Hartzenberg (028)551-1023 ext 26 (028)550-1766	P O Box 30 LADISMITH (KAAP) 6655
Kimberley	Mr K Bogacwi (053)830-6400 (053)832-2230	Private Bag X5030 KIMBERLEY 8300
King Sabata Dalindyebo	Mr P Bezuidenhout (047)501-4304/5 (047)531-2704	P O Box 57 UMTATA 5100
Klerksdorp	Mr CJ Coertze (018)484-1471 X 243 (018)484-2833	P O Box 20 STILFONTEIN 2550
Knysna	Mr LR Richardson (044)382-5066 (044)382-5551	P O Box 21 KNYSNA 6570
Kouga	Mr DW Pennels (042)294-0309 (042)294-0312	P O Box 137 ST FRANCIS BAY 6312
Kungwini	Mnr DJ Botha (013)932-0061 (013)935-1311	Posbus 40 BRONKHORSTSPRUIT 1020
Kwadukuza	Mr LF Klopper (032)551-3091 (032)551-5500	P O Box 72 STANGER 4450
Langeberg	Mr G Mans (028)713-2418	P O Box 29 RIVERSDALE 6670

Lekwa	Mr D Lottering (017)712-5200 (017)712-6808	P O Box 66 STANDERTON 2430
Lesedi	Mr HB Coetsee (016)341-3111 (016)341-6458	P O Box 201 HEIDELBERG 2400
Lichtenberg	Mr D Lowe (018)673-1007 (018)673-1674	P O Box 31 COLIGNY 2725
Lukanji	Mr MJ Brewis (045)838-2684 (045)838-2684	Private Bag X7111 QUEENSTOWN 5320
Mafube	Mr AP Linde 0588-31051 0588-33072	P O Box 2 FRANKFORT 9830
Magalakwena	Mr JN Fourie (015)491-9601 (015)491-9755	P O Box 34 POTGIETERSRUS 0600
Makhado	Mr E Joubert (015)516-0212 (015)516-1195	P O Box 96 LOUIS TRICHARDT 0920
Freestate Prov.	Mr HP Pretorius (051)405-4730 (051)405-5008	Posbus 211 BLOEMFONTEIN 9300
Mantsopa	The Electrical Engineer (051)673-1018 (051)673-1550	P O Box 20 ZASTRON 9950
Masilonya	Mnr AJ Castelyn (051)821-2222 (051)821-1078	Posbus 13 BRANDFORT 9400
Masilonya	The_Electrical_Engineer (057)733-0106	P O Box 8 THEUNISSEN 9410
Matjhabeng	Mr LC Herbst (057)573-2055 (057)753-2058	P O Box 29 HENNENMAN 9445
Matjhabeng	Mr GJ Meyer (057)391-3116 (057)391-3450	P O Box 708 WELKOM 9460
Matzikama	Mr JH Viljoen (027)213-1045 (027)213-3238	P O Box 98 VREDENDAL 8160
Merafong	Mr JA Bezuidenhout (018)771-6110 (018)771-6359	P O Box 1 FOCHVILLE 2515
Messina	Mr JAP du Toit (015)534-0211 (015)534-2513	Private Bag X611 MESSINA 0900
Middelburg	Mr JA Kok (049)842-1122 (049)842-2252	P O Box 55 MIDDELBURG 5900
Mkhondo	Mr HG Botha (017)826-2211 (017)826-0330	P O Box 23 PIET RETIEF 2380
Lephalele	Mr A Both (014)763-2193 (014)763-5662	Private Bag X136 ELLISRAS 0555
Letsemeng	Mr J Sinden (053)205-0007 (053)205-0128	P O Box 7 KOFFIEFONTEIN 9986
Lichtenberg	Mr C Geldenhuys (018)632-5051 X 2201 (018)632-5247	P O Box 7 LICHTENBURG 2740
Madibeng	Mnr JL Mynhardt (012)318-9333 (012)318-9354	Posbus 106 BRITS 0250
Magalakwena	Mr van der Horst (0154)491-2244 (0154)491-5142	P O Box 34 POTGIETERSRUS 0600
Makana	Mr WR Bufe (046)603-6050 (046)622-5264	P O Box 176 GRAHAMSTOWN 6140
Maletswai	Hoof Elektriese Ingenieur (051)633-2406 (051)633-2401	Privaat Sak X1011 ALIWAL NOORD 9750
Mangaung	Mnr AJ van der Merwe (051)409-2210/1 (051)409-2366	Posbus 3704 BLOEMFONTEIN 9300
Mantsopa	Mr HD Potgieter (051)924-0654 (051)924-0305	P O Box 64 LADYBRAND 9745
Masilonya	Mr LC Meyer (051)881-0003 (051)881-0003	P O Box 26 WINBURG 9420
Matatiele Electricity	The Electrical Engineer (039)737-3135	P O Box 35 MATATIELE 4730
Matjhabeng	Mr SH Jansen (057)212-3111 (057)212-2885	Private Bag X7 VIRGINIA 9430
Matjhabeng	Mr W Sephton (057)398-1733 (057)398-1756	P O Box 21 ODENDAALSRUS 9480
Mbombela	Mr CL Rossouw (013)759-2230 (013)752-7168	P O Box 45 NELSPRUIT
Merafong	Mr LC Spies (018)788-9651 (018)788-9659	P O Box 3 CARLTONVILLE 2500
Metsimaholo	Mr HJ van Wyk (016)976-0029 X 145 (016)976-0029 X 183	P O Box 60 SASOLBURG 9570
Middelburg	Mr R Grunig (013)249-7220 (013)243-2550	P O Box 14 MIDDELBURG 1050
Mngeni	The Engineer (033)330-6124 (033)330-4183	P O Box 5 HOWICK 3290

Modimolle	Mr JJ Kasselman (014)717-5211 (014)717-4077	Private Bag X1008 NYLSTROOM 0510
Mogale City	Mr F Erasmus (011)951-2254 (011)665-2666	P O Box 94 KRUGERSDORP 1740
Moqhaka	Mr MJ Brewis (056)216-9283 (056)216-9284	P O Box 302 KROONSTAD 9500
Mossel Bay	Mr G Willemse (044)620-2100 (044)620-2853	Private Bag X29 MOSSELBAY 6500
Mpofana	Mr G Smith (033)263-1221 (033)263-1127	P O Box 47 MOOI RIVER 3300
Mthonjaneni	Mr P Harnalainen (035)450-2082 (035)450-3224	P O Box 11 MELMOTH 3835
Nala	Mnr TE Tokwana (056)514-9200 (056)515-3922	Privaat Sak X15 BOTHAVILLE 9660
Naledi	Mr JF Kies (053)928-2267 (053)928-2258	P O Box 35 VRYBURG 8600
Ndlambe	Mr B Patterson (046)624-1140 (046)624-4872	P O Box 13 PORT ALFRED 6170
Nelson Mandela	Mr GF Ferreira (041)994-1262 (041)994-1335	P O Box 45 UITENHAGE 6230
Newcastle	Mr RJ Mallinson (034)312-1296 (034)312-9697	Private Bag X6621 NEWCASTLE 2940
Ngwathe	Mr HW Coetzer (056)811-2131 (056)817-6343	P O Box 359 PARYS 9585
Nketoana	Mr CP Wickham (058)863-2811 (058)863-2523	P O Box 26 REITZ 9810
Northern Electricity	Mr CGN Huysen (092646)722-2244/3 (092646)722-2245	P O Box 891 TSUNEM, NAMIBIA
Otjiwarongo Electricity	Mr G Hanssen (092646)730-2231 (092646)730-2090	Private Bag X2209 OTJIWARONGO NAMIBIA
Overstrand	Mr M van Zijl (028)271-4010 (028)271-4100	Private Bag X3 KLEINMOND 7195
Overstrand	Mr D Maree (028)384-0111 (028)384-0241	Posbus 26 GANSBAAI 7220
Phokwane	Mr MJM Blaauw (053)474-0143 (053)474-1768	Private Bag X3 HARTSWATER 8570
Polokwane	Mr DET Potgieter (015)290-2270 (015)290-2249	P O Box 111 PIETERSBURG 0700
Modimolle	Mnr G van der Merwe (014)717-1344 (014)717-3886	Privaat Sak X1018 NYLSTROOM 0510
Mookgophong	Mr CP Cloete (014)743-1111 (014)743-2434	Private Bag X340 NABOOMSPRUIT 0560
Moqhaka	Mr CL Engelbrecht (056)343-3148 (056)343-2505	Private Bag X02 VILJOENSKROON 9520
Mossel Bay	Mr O Bothma (044)691-2215 (044)691-1903	P O Box 25 MOSSELBAAI 6500
Msukaligwa	Mr TJ Bezuidenthout (017)624-3000 (017)624-5232	Posbus 3 BETHAL 2310
Nala	Mr JJ Heimans (057)899-1818 (057)899-2631	P O Box 6 WESSELSBRON 9680
Naledi	Mev L Burger (051)541-0012 (051)541-0556	Private Bag X1 DEWETSDORP 9940
Naledi	Mr A Smit (053)928-2203 (053)928-3482	P O Box 82 STELLA 8650
Nelson Mandela	Mr D Michie (041)392-4101 (041)392-4333	P O Box 369 PORT ELIZABETH 6000
Nelson Mandela	Mr W Meyer (041)933-1111 (041)933-2721	P O Box 42 DESPATCH 6220
Ngwathe	Mr PJJ Uys (056)777-1819 (056)777-2745	P O Box 14 KOPPIES 9540
Ngwathe	Mr T Cunningham (058)853-1023 (058)853-1024	P O Box 45 HEILBRON 9650
Nkonkobe	Mr MF Steyn (046)645-1420 (046)645-1619	P O Box 36 FORT BEAUFORT 5720
Nxuba	Mr J Erasmus (046)684-0034 (046)684-0034	Privaat Sak X350 ADELAIDE 5760
Oudtshoorn	Mr JJG Nel (044)272-2221 (044)272-3512	P O Box 255 OUDTSHOORN 6620
Overstrand	The Electrical Engineer (028)313-8020 (028)312-4098	P O Box 20 HERMANUS 7220
Phokwane	Mr J van der Westhuizen (053)456-0111 (053)456-0022	Private Bag X3 HARTSWATER 8570
Plettenberg Bay	Mr B van Jaarsveldt (044)533-2050 (044)533-3485/7	PO Box 26 PLETTENBERG BAY 6600
Potchefstroom	Mr S Steyn (018)299-5352 (018)297-5130	P O Box 113 POTCHEFSTROOM 2520

Randfontein	Mr GJ Booysen (012)372-0412 (012)372-0413	P O Box 50233 HERCULES 0030
Rustenberg	Mr A Viljoen (014)590-3170 (014)592-0108	P O Box 16 RUSTENBERG
Sedibeng DC	Mr E van Helden (016)422-5465 (016)455-4522	P O Box 471 VEREENIGING 1930
Seme	The Electrical Engineer (017)735-5141 (017)735-3004	Private Bag X9011 VOLKSRUST 2470
Setsoto	The Electrical Engineer (051)933-2322 (051)933-3321	P O Box 116 FICKSBURG 9730
Siyathemba	Mr CN van Wyk (053)353-3002 (053)353-1386	P O Box 16 PRIESKA 8940
Stellenbosch	Mr F Koegelenberg (021)876-2055 (021)876-3297	P O Box 18 FRANSCHHOEK 7690
Swartland	Mr PJ Uys (022)451-2366 (022)451-2453	P O Box 1 YZERFONTEIN 7351
Swartland	Mr R du Toit (022)482-2996 (022)482-2935	Private Bag X52 MALMESBURY 7300
Swellendam	Mr K McKay (028)514-1100 (028)514-2458	PO Box 20 SWELLENDAM 6740
Thaba Chweu	Mr D Bester (013)764-1241 (013)764-2860	P O Box 61 SABIE 1260
Thabazimbi	Mr LA Dreyer (014)777-1525 (014)777-1531	P O Box 90 THABAZIMBI 0380
Theewaterskloof	Mnr F du Toit (028)212-1090 (028)214-1289	Posbus 24 CALEDON 7230
Tshwane	Mnr JPE Swarts (012)521-8000 (012)521-0814	Posbus 58393 KARENPARK 0118
Tshwane	Mr F du Toit (012)671-7332 (012)671-7356	P O Box 14013 LYTTLETON 0140
Tswelopele	Mr T Janse van Rensburg (053)203-0008 (053)203-0490	Private Bag X3 HOPETOWN 8750
uMhlathuze	Mr DJ van Wyk (035)901-5350 (035)901-5381/5444	Private Bag X1004 RICHARDSBAY 3900
Umlalazi	Mr J le Grange (035)474-1141 (035)474-4733	P O Box 37 ESHOWE 3815
Umvoti	Mr T Rajnarain (033)413-9148 (033)417-1393	P O Box 71 GREYTOWN 3500
Randfontein	Mr JJ Donaldson (011)411-0216 (011)412-3424	P O Box 218 RANDFONTEIN 1760
Re A Ipela	Mr MPL de Jager (053)313-0343 (053)313-1602	P O Box 5 POSTMASBURG 8420
Saldanha Bay	Mr J du Plessis (022)701-7050 (022)715-1518	Private Bag X12 VREDENBURG 7380
Sedibeng DC	Mr E van Helden Engineer (016)450-3257 (016)455-4522	P O Box 471 VEREENIGING 1930
Sentrale Karoo	Mr G Stopforth (053)621-0026 (053)621-0368	Private Bag X329 VICTORIA-WES 7070
Setsoto	Mr AJ Addinall (058)481-2142 (058)481-5154	P O Box 20 SENEKAL 9600
Stellenbosch	Mr B Naude (021)808-8404 (021)808-8409	P O Box 17 STELLENBOSCH 7599
Swartland	Mr van der Berg (022)492-2237 (022)492-3217	P O Box 5 DARLING 7345
Swartland	Mr TF Rossouw (022)433-2246 (022)433-3102	Private Bag X08 MOORREESBURG 7310
Swaziland Electricity Board	Mr B Farrer (09268)404-6638 (09268)404-0962	P O Box 258 MBABANE SWAZILAND
Swellendam	Mr D van Vuuren (028)572-1082 (028)572-1358	P O Box 147 BARRYDALE 6750
Thaba Chweu	Mr GG Verster (013)235-2121 X 152 (013)235-1108	P O Box 61 LYDENBURG 1120
The Msunduzi Municipality	Mr PE Fowles (033)355-1400 (033)355-1559	P O Box 399 PIETERMARITZBURG 3200
Tshwane	Mr JA Ehrich (012)308-4100/1 (012)308-4149	P O Box 423 PRETORIA 0001
Tshwane	Mr C Oelofse (012)337-4181 (012)323-5137	P O Box 6338 PRETORIA 0001
Tswelopele	Mnr JJF Steyn (051)853-1333 (051)853-1332	Posbus 3 BULTFONTEIN 9670
Ulundi Municipality	Mr V Xaba (035)870-0501 (035)870-1392	Private Bag X17 ULUNDI 3838
Umjindi	Mnr AWJ Landsberg (013)712-2121 (013)712-5120	Posbus 33 BARBERTON 1300
Umtshezi Municipality	Mr D Vujovic (036)352-3000 (036)352-5829	P O Box 15 ESTCOURT 3310

Utrecht	Mr NM Dekker (034)331-3041 (034)331-4312	P O Box 11 UTRECHT 2980
Walvis Bay Electricity Dept	Mr G Coeln (092646)420-3664 (092646)420-4574	Private Bag X5017 WALVIS BAY NAMIBIA
Westonaria	Mr FN Quinn (011)753-1121 (011)753-4176	P O Box 19 WESTONARIA 1780
Witzenberg	Mr JA Kok (023)631-1021 (023)631-3161	Private Bag X4 WOLSELEY 6830
Witzenberg	Mr B van der Walt (023)316-1854 (023)316-1877	P O Box 44 CERES 6835
Ventersdorp	Mr CP Terblanche (018)264-2051 (018)264-2051	P O Box 15 VENTERSDORP 2710
West Rand DC	Mr ME Belot (011)411-5000 (011)412-3663	Private Bag X033 RANDFONTEIN 1760
Windhoek	Mr FA Diener (0926461)290-2455 (0926461)290-2494	P O Box 5011 WINDHOEK NAMIBIA
Witzenberg	Mr ST Young (023)230-1020 (023)230-1250	P O Box 44 CERE 6835
Zeerust	Mr JG Joubert (018)642-1081 (018)642-2618	P O Box 92 ZEERUST 2865

RETIRED MEMBERS

CA	Anderson	Bellisstraat 6 KILNER PARK 0186
William	Atteridge	P O Box 32065 SUMMERSTRAND 6019
RV	Bailey	"The Lodge" Private Bag X5 BRYANSTON 2021
JJ	Barrie	P O Box 1195 HOWICK 3290
BF	Berwyn-Taylor	3 Thornton Road DIEP RIVER 7800
KH	Bobek	P.O.Box 10203 MARINE PARADE 4056
Bokkie	Boshoff	Posbus 616 VANDERBIJLPARK 1900
IF	Boyack	44-15th Street MENLO PARK 0081
JG	Brümmer	Adriaan Moreesstr 7 STELLENBOSCH 7600
CR	Burton	54 Memorial Road KIMBERLEY 8301
AR	Campbell	P.O.Box 3 IMPENDHELE 4545
EC	Chapman	Posbus 15 BRAKPAN 1540
DJR	Conradie	Posbus 188 VILLAGE OF HAPPINESS 4280
S.J.	Conradie	POSBUS 88 RICHMOND 7010
WF	Cronjé	Wenningstraat 37 GROENKLOOF 0181
EE	de Villiers	Impala Park 23, Impalaweg IRENE 1675
HC	Dreyer	Kommissarisstraat 107 WELGEMOED 7530
JAD	Foubister	5 Willlow Way PINELANDS 7405
RR	Gilmour	26 Barling Crescent Fish Hoek 7975
A	Greyling	Private Bag X995 PRETORIA 0001
RB	Gwilt	34 Cornelia Avenue FRAMESBY, Port Elizabeth 6045
PH	Harvey	P.O.Box 581 GREYTOWN 3500
M	Hoffenberg	P O Box 10239 PORT SHEPTSTONE 4240
GT	Honniball	P.O.Box 17031 GROENKLOOF 0027
Tony	Hugo	P O Box 68218 BRYANSTON 2021
Nat	Kirschner	37 Murray st Waverley 2090
Mike	Lang	P O Box 437 HENLY ON KLIP 1962
Kobus	Lochner	Sunrise View 69 Private Bag 11 ELARDUSPARK 0047
HAL	Louw	Altenburglaan 1 SUIDER PAARL 7646
Peter	Muller	8 Ribble Terrace THREE RIVERS 1929
KJ	Murphy	6 Gable Street SOMERSET WEST 7130
JJG	Nel	van Riebeeckweg 300 OUDTSHOORN 6620
Gawie	Nortje	Garnetweg 14 Albemarle, GERMISTON 1401
PVE	Pagel	TUINSTRAAT 72 Doornkloof, MOORREESBURG 7310
ER	Polkinghorne	66 estmoreland Road KENSINGTON 2094
WJ	Reichert	20 Brander Avenue BLOUBERGRANT 7443
JB	Rheeder	2 Iris Place BEACON BAY EAST LONDON, 5241
CJ	Scherman	P O Box 32437 GLENSTANTIA 0010
TP	Schreuder	P.O.Box 591 VREDENDAL 8160
AJ	van den Berg	Voortrekkerweg 312 Noordheuwel, KRUGERSDORP 1739
RJ	Van der Berg	14 Dan Street OLIFANTSFONTEIN 1666
FJ	van der Merwe	Posbus 74087 LYNNWOODRIF 0040
GA	Venter	Ligtenstraat 8 MEYERTON 1960
JA	Venter	Fairtrees Aftree-Oord 50 Kingfisherweg DURBANVILLE 7551
Chris	Vosloo	P O Box 2520 NYLSTROOM 0510

ORDINARY MEMBERS

City/Town	Associate Member Tel/Fax	Address	City /Town	Associate Member Tel/Fax	Address
Breede River/ Winelands	Mr CJ Voster (023) 614-1112 (023) 614-1841	P O Box 24 MONTAGU 6720	Breede Rivier / Winelands	Mnr AF de Villiers (023) 616-2105/6 (023) 616-2739	Posbus 10 BONNIEVALE 6730
Breede Rivier / Winelands	Mr C Swart (023) 615-1100 (023) 615-1563	Private Bag X2 ASHTON 6715	Breederivier/ Winelands	Mr J Rossouw (023) 626-3112 (023) 626-2426	P O Box 52 ROBERTSON 6705
Camdeboo	Clr E Kekane (049) 892-5492 (049) 892-4319	P O Box 71 GRAAFF-RIENET 6280	Camdeboo	Mr A van Zyl (049) 892-2121 (049) 892-4319	P O Box 71 GRAAF-RIENET 6280
Camdeboo	Mr IJ Orsmond (049) 846-0014 (049) 894-0174	P O Box 30 ABERDEEN 6270	City of Cape Town	Mr G Munro (021) 400-2210 (021) 421-5088	P.O.Box 82 CAPE TOWN 8000
City of Cape Town	Mr G Pool (021) 918-7132 (021) 918-7158	Private Bag X44 BELLVILLE 7535	City of Cape Town	Mnr HJ Wiid (021) 850-4392 (021) 850-4435	Posbus 19 SOMERSET WES 7139
City of Cape Town	Mnr IP Botha (021) 850-4395 (021) 850-4435	P O Box 3 STRAND 7139	City of Cape Town	Mnr J Kaltwasser (021) 900-1573 (021) 900-1559	Posbus 68 KUILSRIVIER 7580
City of Cape Town	Mr N Ballantyne (021) 400-2052 (021) 421-7697	P.O. Box 82 Cape Town 8001	City of Cape Town	Mr R van der Riet (021) 918-7010 (021) 918-7088	Private Bag X44 BELLVILLE 7535
City of Cape Town	Mr HO Boshoff (021) 918-7070 (021) 918-7021	Private Bag X44 BELLVILLE 7535	City of Johannesburg	Mnr AG Booyzen (011) 490-7309 (011) 490-7317	P/Sak X30 ROODEPOORT 1725

City Power	Mr CE Cooper-Chadwick (011) 793-1105 (011) 793-6816	P O Box 136522 ALBERTON NORTH 1456	City Power	Mr GR Teunissen (011) 490-7550 (011) 490-7291	P O Box 38766 BOOYSENS 2016
Dihlabeng	Mr R Lloyd (058) 303-5732 (058) 303-8451	P O Box 551 BETHLEHEM 9700	Drakenstein	Mr A Viljoen (021) 871-1911 (021) 872-4074	P O Box 1 PAARL 7622
Drakenstein	Mr E Carratu (021) 871-1911 (021) 872-4074	P O Box 1 PAARL 7622	Ekhuruleni	Mr A Richardson (011) 741-6360 (011) 741-6372	Private Bag X014 BENONI 1500
Ekhuruleni	Mr E Joubert (011) 741-6360 (011) 741-6372	Private Bag X014 BENONI 1500	Ekhuruleni	Mr W Meades (011) 456-0093 (011) 456-0237	P O Box 25 EDENVALE 1610
Ekhuruleni	Mr P van Rooyen (011) 874-6518 (011) 874-5333	P O Box 145 GERMISTON 1400	Ekhuruleni	Mr D Jamieson (011) 921-2477 (011) 975-4614	P O Box 13 KEMPTON PARK 1620
Ekhuruleni	Mr W Nel (011) 456-0086 (011) 456-0237	P O Box 25 EDENVALE 1610	Ekurhuleni	Mnr BC Lamprecht (011) 741-6361 (011) 741-6372	Private Bag X014 BENONI 1500
Ekurhuleni	Mr A Blignaut (011) 921-2415 (011) 975-4614	P O Box 13 KEMPTON PARK 1620	Ekurhuleni	Mr AF Gilfillan (011) 360-6093 (011) 814-3950	P O Box 23 NIGEL 1490
Ekurhuleni	Mr D Jamieson (011) 921-2477 (011) 975-4614	P O Box 13 KEMPTON PARK 1620	Ekurhuleni	Mr J Venter (011) 921-2397 (011) 975-4614	P O Box 13 KEMPTON PARK 1620
Ekurhuleni	Mr JJG Dreyer (011) 861-2389 (011) 861-2048	P O Box 4 ALBERTON 1450	Ekurhuleni	The Engineer (011) 820-4231 (011) 820-4011	Private Bag X1069 GERMISTON 1400
Ekurhuleni	Mr H Marx (011) 874-6765 (011) 874-5333	P O Box 145 GERMISTON 1400	Ekurhuleni	Mr W Hunt (011) 811-2290 (011) 811-2562	P O Box 45 SPRINGS 1560
Ekurhuleni	Mr KGF Botha (011) 921-2334 (011) 975-4614	P O Box 13 KEMPTON PARK 1620	Ekurhuleni	Mnr L Kruger (011) 899-4021 (011) 892-4806	P O Box 215 BOKSBURG 1460

Ekurhuleni	MnrLDM de Wet (011) 899-4021 (011) 892-4806	Posbus 215 BOKSBURG 1460	Ekurhuleni	Mr P Nortje (011) 360-6095 (011) 814-3950	P O Box 23 NIGEL 1490
Ekurhuleni	Mr S Delport (011) 741-2050 (011) 741-2075	P O Box 15 BRAKPAN 1540	Ekurhuleni	Mr A Smit (011) 741-6360 (011) 741-6372	P/Bag X014 BENONI 1500
eThekwini	Mr RF Wienand (031) 300-1003/5 (031) 306-3196	P.O.Box 147 DURBAN 4000	eThekwini	Mr A Gower (031) 300-1006 (031) 300-1010	P.O.Box 147 DURBAN 4000
eThekwini	Mr AJ Dold (031) 300-1002 (031) 300-1010	P.O.Box 147 DURBAN 4000	eThekwini	Mr B Finch (031) 300-1008 (031) 300-1010	P.O.Box 147 DURBAN 4000
eThekwini	Mr C Bitcon (031) 300-1007 (031) 300-1010	P.O.Box 147 DURBAN 4000	eThekwini	Mnr G Cronjè (035) 901-1674 (035) 901-1609	Posbus 115 EMPANGENI 3880
eThekwini	Mr R Sharp (031) 300-1301 (031) 300-1010	P.O.Box 147 DURBAN 4000	George	Mr D Fourie (044) 874-3917 (044) 874-3936	P O Box 19 GEORGE 6530
George	Mr HW Mutasah (044) 874-3917 (044) 874-3936	P O Box 19 GEORGE 6530	George	Mr J Moller (044) 874-3917 (044) 874-3936	P O Box 19 GEORGE 6530
George	Mr J van der Westhuizen (044) 874-3917 (044) 874-3936	P O Box 19 GEORGE 6530	Greater Tzaneen	Mr N Fourie (015) 307-8161 (015) 307-8049	P O Box 24 TZANEEN 0850
Greater Tzaneen	Mr A Loubscher (015) 307-8167 (015) 307-8049	P O Box 24 TZANEEN 0850	Greater Tzaneen	Mr S Lelope (015) 307-8165 (015) 307-8049	P O Box 24 TZANEEN 0850
Klerksdorp	Mnr FJ Goosen (018) 2-2835 (018) 64-1780	Posbus 1046 KLERKSDORP 2570	Lephalale	Mnr MF Loots (014) 763-2193 (014) 763-5662	P/Sak X136 ELLISRAS 0555
Lichtenberg	MnrJ Wille (014) 412-5051	Posbus 7 LICHTENBURG 2740	Mangaung	Mr B de Jager (051) 409-2214 (051) 409-2366	P O Box 3704 BLOEMFONTEI N 9300
Mangaung	Mr L Kritzinger (051) 409-2213 (051) 409-2377	P O Box 3704 BLOEMFONTEIN 9300	Mangaung	Mr SJ van den Berg (051) 409-2325 (051) 409-2400	P O Box 3704 BLOEMFONTEI N 9300

Mangaung	Mr SPJ Rossouw (051) 409-2285 (051) 409-2399	P O Box 3704 BLOEMFONTEIN 9300		Mbombela	Mr C Mogiba (013) 759-2230 (013) 752-7168	P O Box 45 NELSPRUIT 1200
Mbombela	Mr E Thabethi (013) 759-2230 (013) 752-7168	P O Box 45 NELSPRUIT 1200		Mbombela	Mr P Fourie (013) 751-1184 (013) 751-2667	P O Box 2 WHITERIVER 1240
Mogale	Mnr CP Odendaal (011) 951-2260 (011) 665-2666	Posbus 94 KRUGERSDORP 1740		Nelson Mandela	Mnr WFT van Reenen (041) 994-1111 (041) 994-1335	Posbus 45 UITENHAGE 6230
Polokwane	Mr W Olivier (015) 290-2271 (015) 290-2249	P O Box 111 PIETERSBURG 0700		Siyathemba	Mr JL Koen (053) 353-3002 (053) 353-1386	P O Box 16 PRIESKA 8940
Stellenbosch	Mnr WFJ van der Walt (021) 808-8405 (021) 808-8409	Posbus 17 STELLENBOSCH 7599		Stilbaai	Mnr IJ Rust (028) 754-1577 (028) 75-41140	Posbus 2 STILBAAI 6674
The Msunduzi Municipality	Mr L Mbumwae (033) 355-1401 (033) 355-1559	P O Box 399 PIETERMARITZB URG 3200		Tshwane	Mnr LC Muller (012) 671-7535 (012) 671-7356	Posbus 14013 LYTTELTON 0140
Tshwane	Mnr WGH Dykman (012) 308-4120 (012) 308-4149	Posbus 423 PRETORIA 0001		Tshwane	Mnr H Lubbinge (012) 308-4110 (012) 308-4149	Posbus 423 PRETORIA 0001
Tshwelepe	Mnr RC Smit (0525) 3-1333 (0525) 3-1664	Posbus 3 BULTFONTEIN 9670		uMhlathuze	Mr G Cronje (035) 901-5380 (035) 901-5444	Private Bag X1004 RICHARDS BAY 3900
uMhlathuze	Mr GJ van den Berg (035) 901-5353 (035) 901-5444	Private Bag X1004 RICHARDS BAY 3900		uMhlathuze	Mr AL Gullan (035) 901-5370 (031) 905-5444	Private Bag X1004 RICHARDS BAY 3900

AFFILIATE MEMBERS

Company	Affiliate Member Phone/ Fax	Address	Company	Affiliate Member Phone/Fax	Address
3M Company	Mr B Wagner (011) 922-2100 (011) 922-2172	P.O.Box 926 ISANDO 1600	ABB Electrical Systems	Mr G Brown (011) 878-8056 (011) 828-0943	P O Box 8080 ELANDSFONTEIN 1406
ABB Installation Material	Mr G Gardiner (011) 314-6950/9 (011) 314-6839	P O Box 7760 HALFWAY HOUSE 1285	ABB Powertech Trans	Ms J Burn (012) 318-9911 (012) 327-1249	P.O.Box 691 PRETORIA 0001
Aberdare Cables	Mr TP van Niekerk (011) 456-4413 (011) 456-4349	P.O.Box 1679 EDENVALE 1610	Aberdare Group	Mr L Steyn (011) 456-4375 (011) 609-4739	P O Box 1679 EDENVALE 1610
ADO Manufacturing	Mr D Smith (021) 712-0307 (021) 712-2613	P O Box 19061 WYNBERG 7824	African Cables	Mr J Badenhorst (016) 430-6136 (016) 423-6103	P O Box 172 VEREENIGING 1930
Africon	Mr HH Nel (012) 427-2310 (011) 427-2344	Posbus 905 PRETORIA 0001	Alcom Systems	Mr V Hoch (011) 235-7650 (011) 807-5428	P.O.Box 5574 RIVONIA 2128
Allyson Lawless	Mrs A Lawless (011) 476-4100 (011) 678-7518	P.O.Box 73285 FAIRLANDS 2030	Alstom Electrical Prod	Mr A Searle (011) 878-3038 (011) 878-3002	P.O.Box 678 GERMISTON 1400
Alstom Measurements	Mr S Braver (011) 820-5111 (011) 820-5220	P O Box 24 PRIMROSE 1416	Alstom T & D	Mr H Broschk (011) 820-5260 (011) 820-5220	P O Box 24 PRIMROSE 1416
Aluex (PTY) Ltd	Mr A Moggee (012) 803-3882 (012) 803-3316	P O Box 412 VEREENIGING 1930	Aluex (Pty) Ltd	Mr D Botha (012) 803-3882 (012) 803-3317	P O Box 1482 SILVERTON 0127
Apple Plastic Technical	Mr Z Modiselle (012) 541-3360 (012) 541-3362	P.O.Box 52651 FOURIESRUS 0024	ATC (Pty) Ltd	Mr W Wakeford (012) 381-1473 /1400 (012) 250-3412	P.O.Box 663 BRITS 0250

Ballenden & Robb	Mr GJ Bester (021) 975-1430 (021) 976-4018	Posbus 311 BELLVILLE 7535	Ballenden & Robb (P.E.)	Mr D Liebenberg (041) 581-2262 (041) 581-4564	P.O.Box 955 PORT ELIZABETH 6000
Beka (PTY) Ltd	Mr W Ludwick (011) 238-0039 (011) 238 0180	P O Box 120 OLIFANTSFONTEIN 1665	Bergman - Ingerop	Mr WJ Pelser (058) 623-0566 (058) 622-2576	Posbus 833 HARRISMITH 9880
Bonesa	Mr B Bredenkamp (012) 427-2619 (012) 427-2935	P O Box 905 PRETORIA 0001	BSL Consultants	Mr LN Theron (013) 243-4343 (013) 243-4300	Posbus 2874 MIDDELBURG 1050
BVI Consulting	Mr K Gertenbach (054) 337-6600 (054) 337-6699	Posbus 1155 UPINGTON 8800	CA Du Toit & Vennote	Mr TP Slade (012) 346-0893 (012) 346-9700	P O Box 2145 BROOKLYN SQUARE 0075
Carifro Consulting Eng	Mr D Carpenter (041) 365-5210 (041) 365-1856	7 Frank Street NEWTON PARK 6045	CDS Electrical Engineers	Mr G Human (051) 430-8222 (051) 430-8220	P O BOX 28974 DANHOF 9310
Circuit Breaker Industries	Mr C Oliver (011) 928-2000 (011) 392-2354	Private Bag 2016 ISANDO 1600	Clinkscales	Mr FP Conradie (044) 874-1511 (044) 874-1510	P O BOX 2551 GEORGE 6530
Clinkscales Maughan	Mr Ron Torrance (021) 448-9050 (021) 448-9058	P.O.Box 12901 MOWBRAY 7705	Clipsal South Africa	Mr D Evans (011) 314-5200 (011) 314-5294	P.O.Box 50012 MIDRAND 1683
Conlog	Mr I Becks (031) 268-1228 (031) 268-1500	P.O.Box 2332 DURBAN 4000	Conradie & Venter	Mr CL Meintjes (051) 447-1636 (051) 430-8316	P.O.Box 1009 BLOEMFONTEIN 9300
Consolidated Power Products	Mr BH Berelowitz (011) 805-4281 (011) 805-1132	P/Bag X42 HALFWAY HOUSE 1685	Crabtree Electrical	Mr L Whitford (011) 874-7600 (011) 827-5320	P.O.Box 14040 WADEVILLE 1422
CT Lab	Mr WF Van Wyk (021) 880-9915 (021) 880-1088	P O Box 897 STELLENBOSCH 7599	CU AL Engineering	Mr M Walsh (011) 740-0660 (011) 740-0189	P.O.Box 1529 BRAKPAN 1540
D.J.J. Conradie & Vennote	Mr P Hoffmann (012) 349-1105 (012) 349-2693	Posbus 35301 MENLOPARK 0102	D.L.V kwa-Zulu Natal	Mr LJ Barnett (031) 266-0881 (031) 266-4906	P.O.Box 408 WESTVILLE 3630

D.L.V. Phambili	Mr DJ Morgan (043) 742-1110 (043) 742-1116	P.O.Box 19730 TECOMA EAST LONDON, 5214	De Villiers & Moore	Mr CH Basson (021) 976-3087 (021) 976-2716	P.O.Box 472 DURBANVILLE 7550
Deltaplan Consulting Eng	Mr JL Mocke (018) 462-9969 (018) 464-1887	P.O.Box 2716 KLERKSDORP 2570	Desta Power Matla	Mr S de Oliveira (011) 835-1011 (011) 835-1717	P.O.Box 38354 BOOYSENS 2016
Dorbyl Structural Prod	Ms G Dytor (016) 421-3300 (016) 422-3791	P.O.Box 2538 VEREENIGING 1930	Drivecor	Mr B Magee (011) 622 8711 (011) 622 4441	113 Langermann Drive KENSINGTON 2094
Eberhardt-Martin	Mr R Martin (011) 673-2036 (011) 673-2043	P.O.Box 58365 NEWVILLE 2114	EE Publishers cc	Mr C Yelland (011) 659-0504 (011) 659-0343 \0501	P.O.Box 458 MULDERSDRIFT 1747
EHT Cables cc	Mr. M Burls (021) 706-1048 (021) 705-6832	15 Walloon Road CONSTANTIA 7806	Electrical Contractors	Mr T McDonald (011) 392-0030 (011) 974-9402	P.O.Box 9683 EDENGLEN 1613
Electricite De France	Mrs V Mundell (011) 884-2076 (011) 884-2473	P.O.Box 848 STRATHAVON 2031	Elektroplan Consulting	Mr S Carrack (012) 663-5420 (012) 663-7106	P.O.Box 13165 CLUBVIEW 0014
Elexpert (Pty) Ltd	Mr. HB Barnard (011) 787-7566 (011) 787-7566	P O Box 4069 RANDBURG 2125	Emcon	Mr R Tobich (092646) 122-4725 (092646) 123-3207	P.O.Box 1900 WINDHOEK Namibia
Energy Measurements	Mr N Jackson (011) 921-7900 (011) 921 7977	P.O. Box 281 Isando 1600	Eskom - PtM	Ms R Mahuma (011) 800-2767 (011) 315-0831	P O Box 11557 VORNA VALLEY 1686
Eskom	Mr W de Beer (043) 703-2369 (043) 703-2412	Private Bag X1 BEACON BAY 5201	Eskom (UtilMark)	Mr K Campbell (011) 800-4203 (011) 800-4989	P O BOX 1091 JOHANNESBURG 2000
FARAD (Pty) Ltd	Mr P Gerber (011) 726-4090 (011) 726-4531	P.O.Box 31220 BRAAMFONTEIN 2017	Ferreira, Wessels & Bisschoff	Mr JM Wessels (031) 23-6201 (031) 23-6294	P.O.Box 6076 DURBAN 4000
Foursome Technologies	Mr. G Urban (044) 871-3188 (044) 871-3187	P O Box 3112 GEORGE Ind. 6536	Frelco	Mr JB Hendriks (011) 823-1691 (011) 823-1694	P O Box 14620 WITFIELD 1467

Futura Projects	Dr H Du Plessis (021) 854-7515 (021) 854-4506	P O Box 2838 SOMERSET WEST 7124	Gaucon Consulting	Mr J Cronjè (011) 792-6424 (011) 792-0696	P.O.Box 2920 HONEYDEW 2040
GE Harris Energy Cont	Mr. D Grunewald (011) 237-0145 (011) 237-0121	P O Box 76672 WENDYWOOD 2144	Genlux Lighting	Mr. JE Tavendale (011) 872-0336 (011) 872-0335	P O Box 1183 GERMISTON 1400
GIBB Africa	Mr D Irving (021) 469-9100 (021) 424-5571	P.O.Box 3965 CAPE TOWN 8000	Grinpal Energy Management	Mr A Van Jaarsveld (012) 674-3500 (012) 657-0032	P O Box 8613 CENTURION 0046
H V Test cc	Mr R Goodwin (011) 883-2148 (011) 884-2606	P.O.Box 651287 BENMORE 2010	Hawker-Siddeley Transform	Mr J Williams (011) 827-3458 (011) 824-3450	P.O.BOX 9159 ELSBURG 1407
Hellermantyton	Mr B Craig (011) 879-6713 (011) 879-6605	Private Bag X158 RIVONIA 2128	Honorary Member	Mr C Burchell (011) 896-3661	4 De Vries Street Libradene BOKSBURG. 1459
Industrial Poles & Masts	Mr P Meyer (011) 864-7665 (011) 864-3385	P.O. Box 547 ALBERTON 1450	Infranet	Mnr F Cloete (012) 664-3001 (011) 664-0100	Posbus 74609 LYNNWOODRIF 0040
Intelligent Metering	Mr. A Geva (011) 452-1835 (011) 452-8823	99 Van Riebeeck Avenue EDENVALE 1610	Interswitch (Pty) Ltd	Mr D Korner (011) 472-1145 (011) 472-3117	P.O.Box 1681 FLORIDA 1710
Iskhus Power	Mr C Mqaqa (011) 392-4838 (011) 392-5751	P O Box 6807 Homestead, Germiston Germiston 1412	Iso-Tech Systems cc	Mr B MADELEY (011) 791-4530 (011) 791-4558	P O Box 941 FERNDALE 2160
IST Energy (PTY) Ltd	Ms M Lebethe (012) 348-8705 (012) 365-1466	P O Box 95355 WATERKLOOF 0145	Lighting Sciences Africa	Mr J Grundy (011) 425-2203 (011) 425-2205	P.O.Box 309 BENONI 1500
Linegear 2000	Mr G Auton (011) 792-3924 (011) 792-3925	P.O.Box 782625 SANDTON 2146	Lucy Rotary Switches	Mr. J De Castro (011) 914-3555 (011) 914-3592	P O Box 586 BOKSBURG 1460
Lyon & Vennote	Mr M Lyon (016) 981-6270 (016) 933-0277	Posbus 3925 VANDERBIJLPARK 1900	Malesela Taihan Elec	Mr D le Roux (016) 450-8200 (016) 423-1070	P O Box 1643 VEREENIGING 1930

Mapule Consulting	Mr. C Nortje (011) 362-1829 (011) 362-3852	P O Box 1300 SPRINGS 1560	Marqott Holdings	Mr R Neale (011) 653-4450 (011) 653-4460	P.O.Box 757 HALFWAY HOUSE 1685
Measuretronic	Mr P Terblanche	P.O. BOX 39456 BOOYSEN 2016	Merz & McLellan	Mr P Elder (011) 886-6573 (011) 886-8735	P.O.Box 2594 CRAMERVIEW 2060
Motor Scan cc	Mr. MJJ La Musse (031) 207-1168 (031) 207-1168	P O Box 10525 MARINE PARADE 4056	MVDE Meganies & Elek	Mr D De Vries (044) 801-9700 (044) 874-4586	Posbus 1862 GEORGE 0530
N.E.T. (Pty) Ltd	Mr J du Preez (013) 753-3857 (013) 753-3592	Posbus 2792 NELSPRUIT 1200	Nampower	Mr HD Mutschler (0926461) 205-2261 (0926461) 205-2315	P.O.Box 2864 WINDHOEK Namibia
Ndizani Networks	Mr G van der Merwe (012) 653-6035 (012) 653-2688	P O BOX 1120 CENTURION 0046	NEI Transformers	Mr L Schultz (021) 534-2681 (021) 534-5383	P.O.Box 44 EPPINDUST 7475
NETFA	Mr J van Heerden (011) 316-2005 (011) 316-4979	Posbus 144 OLIFANTSFONTEIN 1665	Niewalt Incorporated	Mr G Ross (031) 701-8457 (031) 701-8322	P O Box 827 PINETOWN 3600
Niewalt Pretoria Inc	Mr S van der Walt (012) 991-0723 (012) 991-5799	Posbus 33743 GLENSTANTIA 0010	Nordland (Pty) Ltd	Mr C Nunns (011) 957-2002 (011) 957-2062	P.O.Box 522 MULDERSDRIFT 1747
Nu-Lec Africa	Mr. R St. John (011) 254-6625 (011) 254-6925	Private Bag X139 HALFWAY HOUSE 1685	Osram (Pty) Ltd	Mr W Wilmans (011) 207-5600 (011) 805-1711	Private Bag X206 MIDRAND 1683
P.N. Energy Services	Mr B Gugger (021) 959-5300 (021) 951-4220	P.O.Box 564 KASSELSVLEI 7533	Palace Engineering	Mr M Dlamini (011) 315-2141 (011) 315-2140	P/Bag X65 HALFWAY HOUSE 1685
Parsons Brinckerhoff Africa	Mr A Pringle (011) 787-4141 (011) 886-0359	P.O.Box 41927 CRAIGHALL 2024	Pienaar & Erwee	Mr J Erwee (012) 460-6297 (012) 460-6685	Posbus 27598 SUNNYSIDE 0132
Plant Engineering (Eskom)	Mr B Krummeck (011) 741-3429 (011) 741-3452	Private Bag X012 BENONI 1500	Plantech Associate	Mr J Stapleberg (012)349-2390	P.O. BOX 146 PERSEQUOR PARK 0020
PLP Consulting Engineers	Mr FJ Lotz (0357) 92 1026/7 (0357) 92-2283	Posbus 1521 EMPANGENI 3880	Power Measurement & Distribution	Mr. B Shackleton (044) 873-0762 (044) 873-0764	P O Box 4700 GEORGE EAST 6539

Power Process	Mr. M du Toit (016) 455-1894 (016) 422-1404	P O Box 265358 THREE RIVERS 1935		Preformed Line Prod.	Mr D Kambouris (033) 387-1520 (033) 387-7094	P.O.Box 4015 PIETERMARITZBURG 3200
Prism Group	Mr. S Burger (011) 467-0100 (011) 467-0160	P O Box 901 WITKOPPEN 2068		Prism Pre-Payment Tech	Mr. S Leigh (031) 209-4189 (031) 209-4188	Suite 614/A, Overport Towers Overport City, Overport Durban, 4001
Programme for Com Dev	Mr. W Zulu ka Jama (018) 489-3767 (018) 464-1701	P O Box 100151 STILFONTEIN 2550		Quality of Supply Tech	Mr R Goodland (011) 622-9968 (011) 616-1400	P O Box 751631 GARDENVIEW 2047
Raytech Energy	Mr J Koekemoer (011) 316-1628 (011) 316-1680	P O Box 134 OLIFANTSFONTEIN 1665		Republic Power & Comm	Mr C Curtis (011) 315-0334 (011) 805-1018	P.O.Box 2357 HALFWAY HOUSE 1685
Rescap cc	Mr. H Teubner (011) 886-7874 (011) 787-0178	P O Box 785064 SANDTON 2146		Revenue Investigations	Mr R Binderman (021) 959-5352 (021) 951-4220	P O Box 1131 BRACKENFELL 7561
Revenue Loss Manag	Mr L de Jager (011) 403-6840 /1 (011) 339-5275	P O Box 1108 HEIDELBERG 2400		Reyrolle	Mr HJJ Jacobs (011) 828-0170 (011) 828-0943	P O Box 8080 ELANDSFONTEIN 1406
RMMS Consulting	Mr. E Lambrechts (021) 883-8252 (011) 728-6219	P O Box 545 STELLENBOSCH 7599		Robmet Meters cc	Mr. I Robinson (011) 469-3807 (011) 469-0461	P O Box 4036 RIVONIA 2128
ROCLA	Mr A Offenberg (011) 670-7600 (011) 472-2141	P.O.Box 1480 ROODEPOORT 1725		Roshcon (Pty) Ltd	Mr J Greyling (011) 626-2576 (011) 626-1089	P.O.Box 40879 CLEVELAND 2022
Rotek Engineering	Mr M Cary (011) 629-4461 (011) 626-2109	P O Box 40099 CLEVELAND 2022		RSA Electrical Cable	Mr K Strydom (011) 316-1453 (011) 316-3590	P.O.Box 10496 STRUBENVALE 1570
SABS	Mr S Claasen (012) 428-6613 (012) 428-6246	Private Bag X191 PRETORIA 0001		SAD-ELEC	Mr. A Hepburn (011) 803-1314 (011) 803-7019	P O Box 1049 Rivonia 2128
Scarborough Publications	Mr R Leitner (021) 702-1490 (021) 702-1491	P.O.Box 321 STEENBERG CAPE TOWN 7947		Schneider Electric S.A.	Mr R Bartle (011) 254-6400 (011) 254-6529	Private Bag X139 Halfway House 1685
Schulumberger	Mr. P Coetzee	P O Box 4059 TYGER		Sentech Ltd	Mr JD Martin	Private Bag X06

Measure	(021) 914-3640 (021) 914-3630	VALLEY 7536		(011) 475-4540 (011) 679-5232	HONEYDEW 2040
Sicame SA	Mr J Lagarde (021) 535-0655 (021) 535-0613	P O Box 58 GOODWOOD 7569	Siemens Ltd	Mr B Young (011) 652-2849 (011) 652-2263	Private Bag X71 HALFWAY HOUSE 1685
Siemens Ltd	Mr J Welby (011) 921-7474 (011) 921-7977	Private Bag X71 HALFWAY HOUSE 1685	Sinesonics	Mr D Jelley (011) 456-8200 (011) 452-4841	P.O.Box 605 EDENVALE 1610
Specialist Syst Engin	Mr G Bezuidenhout (012) 663-4331 (012) 663-4335	P O Box 7170 CENTURION 0046	Spectrum Communic.	Mr. C Maasch (021) 551-5800 (021) 551-5809	P O Box 36900 CHEMPET 7442
Spoornet	Mr A Versteeg (011) 773-5165 (011) 773-4556	P O Box 1276 JOUBERT PARK 2040	Stewart Scott	Mr W Seymore (012) 347-1620 (012) 347-1621	Posbus 25302 MONUMENT PARK 0105
Stone-Stamcor	Mr M Talbot (011) 452-1415 (011) 452-1499	P.O.Box 1352 EDENVALE 1610	Strike Technologies	Mr P Scully (011) 315-0815 (011) 315-2559	P.O.Box 1810 HALFWAY HOUSE 1685
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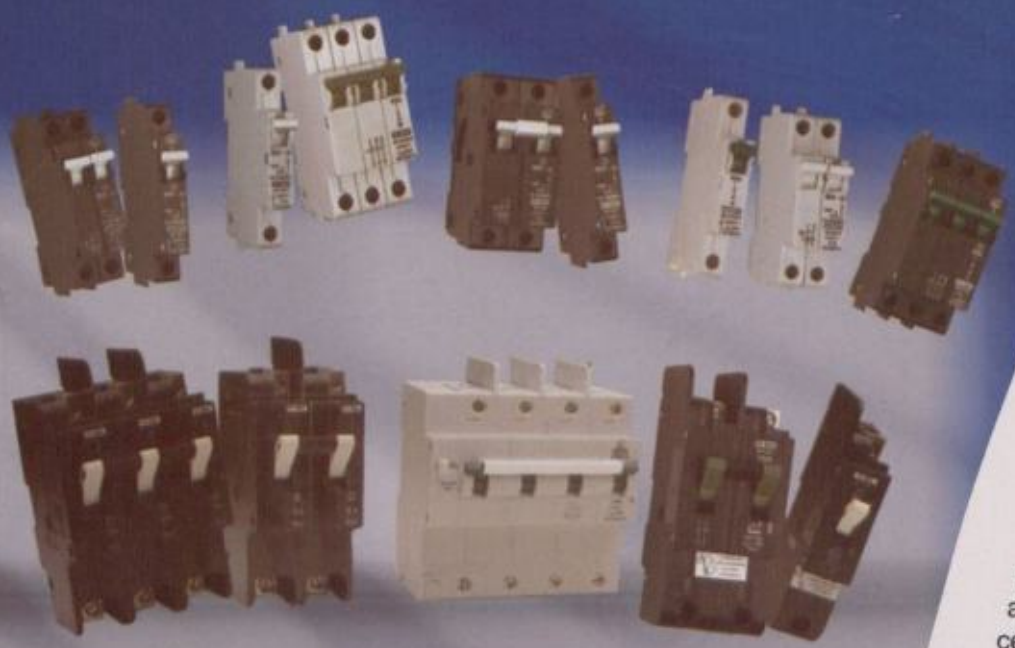

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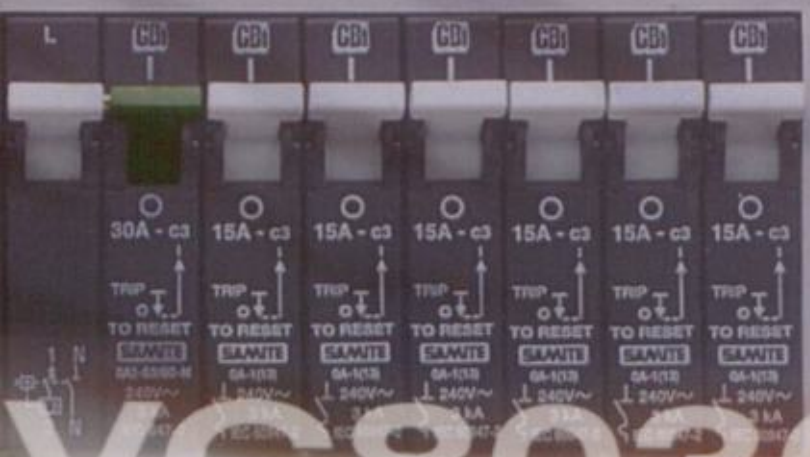

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