

1388/53 24/10/52

**PROCEEDINGS**  
of the  
**Twenty-Seventh Convention**  
of the  
**Association of Municipal  
Electricity Undertakings**  
OF SOUTHERN AFRICA  
(Founded 1915)



held at  
**JOHANNESBURG**  
From Tuesday, April 21st to  
Friday, April 24th  
**1953**

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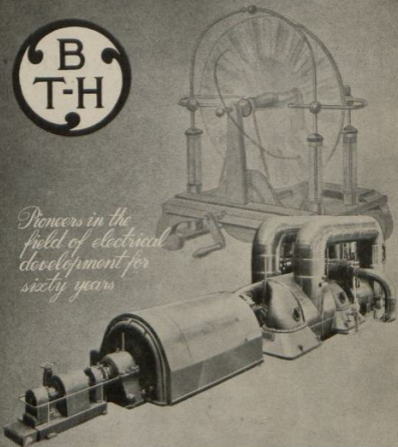
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**Front Row.** — W. Bellad-Ellis (Queenstown, Member of Council), F. T. Stokes (Johannesburg, Hon. Secretary), W. F. Long (Cape Town, Vice-President), J. H. Dobson (Johannesburg, President), A. S. Munro (Pietermaritzburg), W. H. Blatchford (Greytown), E. Poole (Durban).

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA  
FOUNDED 1915

## EXECUTIVE COUNCIL 1953/54

**President:**

J. C. Fraser (Johannesburg)

**Vice President:**

G. J. Muller (Bloemfontein)

**Immediate Past Presidents:**

A. R. Sibson (Bulawayo)

J. C. Downey (Springs)

**Engineer Members**

D. A. Bradley (Port Elizabeth)

C. G. Downie (Cape Town)

C. Kinsman (Durban)

J. E. Mitchell (Salisbury)

J. L. van der Walt (Krugersdorp)

D. J. Hugo (Pretoria)

**Towns represented:**Johannesburg  
DurbanBloemfontein  
SalisburyPort Elizabeth  
KrugersdorpCape Town  
Pretoria

NOTE.—The Town is elected and not the individual Councillors.

**Secretary and Treasurer:**

A. T. Taylor, P.O. Box 7462, Johannesburg.

**Sub-Committees:***Coal Supplies*C. G. Downie (Convenor), D. A. Bradley, G. J. Muller,  
D. J. Hugo.*Registration of Electrical Wiring Contractors**New Title—Electrical Wiremen and Contractors  
Legislation Committee*

C. G. Downie, D. A. Bradley, D. J. Hugo.

*Safety Precautions Committee**New Title—Wiring Regulations Committee*J. C. Downey, G. J. Muller, C. Kinsman, J. L. van der Walt,  
C. G. Downie, J. E. Mitchell.*Papers Sub-Committee*

President, Vice President, Immediate Past President.

*Tariffs Survey Committee*J. L. van der Walt, C. G. Downie, A. R. Sibson, J. C.  
Downey, G. Pulik, Johannesburg—Co-opted.*Representation Committee*

J. C. Downey, D. J. Hugo, J. L. van der Walt, J. C. Fraser.

*Amendments to Constitution and Rules*

G. J. Muller (Convenor), J. C. Fraser, C. Kinsman.

*Recommendations Committee of New Electrical  
Commodities*

D. J. Hugo (Chairman), J. C. Fraser (Vice Chairman).

**Representatives***World Power Conference. (Local Committee)*

J. C. Fraser

*Electrical Wiremen's Registration Board*

J. C. Fraser

*Coal Allocation Committee*

C. G. Downie. Alternate: D. J. Hugo

*Overhead Lines Code of Practice*

J. C. Fraser. Alternate: J. L. van der Walt

*Safety Precautions Committee*

J. C. Downey. Alternate: J. C. Fraser

*Meter Testing Code*

J. L. van der Walt

*S.A. Bureau of Standards—**Safety Codes and other Committees*

J. C. Downey Alternate: J. L. van der Walt

NOTE.—The President is *ex officio* a member of all sub-committees and where the Convenor is not named the first named should be taken as being the Convenor.



PAST OFFICERS AND MEMBERS OF COUNCIL

Past Presidents :

1915-17	J. H. Dobson, Johannesburg
1917-19	J. Roberts, Durban
1919-20	B. Sankey, Port Elizabeth
1920-22	T. C. W. Dod, Pretoria
1922-24	G. H. Swingler, Cape Town
1924-26	J. Roberts, Durban
1926-27	B. Sankey, Johannesburg
1927-29	J. M. Lambe, East London
1929-31	R. Macauley, Bloemfontein
1931-33	L. L. Horrell, Pretoria
1933-34	L. F. Bickell, Port Elizabeth
1934-35	A. R. Metelerkamp, Bulawayo
1935-36	G. G. Ewer, Pietermaritzburg
1936-37	A. Rodwell, Johannesburg
1937-38	J. H. Gyles, Durban
1938-39	H. A. Eastman, Cape Town
1939-44	I. J. Nicholas, Umtata
1944-45	A. Rodwell, Johannesburg
1945-46	J. S. Clinton, Salisbury
	J. W. Phillips, Bulawayo
1946-47	G. J. Muller, Bloemfontein
1947-48	C. Kinsman, Durban
1948-49	A. Foden, East London
1949-50	D. A. Bradley, Port Elizabeth
1950-51	C. R. Hallé, Pietermaritzburg
1951-52	J. C. Downey, Springs
1952-53	A. R. Sibson, Bulawayo

Secretary and Treasurer :

F. T. Stokes, E. T. Price
E. Poole
E. Poole
L. L. Horrell
H. A. Eastman
E. Poole
R. G. Treise
P. Adkins
E. Poole
E. Poole
F. A. P. Perrow
E. Poole
E. Poole
E. Poole
E. Poole
E. Poole
E. Poole until Dec., 1940
L. L. Horrell, Jan., 1941
L. L. Horrell
L. L. Horrell to Nov., 1945
A. T. Taylor, December, 1945
A. T. Taylor
A. T. Taylor
A. T. Taylor
A. T. Taylor
A. T. Taylor
A. T. Taylor
A. T. Taylor

PAST ORDINARY MEMBERS OF COUNCIL

1915-17	J. Roberts, W. Bellad-Ellis, B. Sankey
1917-19	W. Bellad-Ellis, G. Stewart, T. C. W. Dod, T. Jagger
1919-20	W. Bellad-Ellis, G. Stewart, E. T. Price, A. S. Munro
1920-22	L. F. Bickell, T. Millar, L. B. Proctor, E. Poole
1921-24	L. F. Bickell, T. Millar, R. W. Fletcher, J. Roberts
1924-26	T. Jagger, A. S. Munro, T. Millar, L. F. Bickell
1926-27	L. F. Bickell, T. C. W. Dod, T. Millar, E. Poole
1927-29	L. F. Bickell, R. A. Young, T. Millar, E. Poole
1929-30	L. F. Bickell, T. Millar, F. C. D. Mann, G. H. Swingler, A. Rodwell
1931-32	T. Millar, F. C. D. Mann, G. H. Swingler, A. Rodwell
1932-34	T. Millar, J. H. Gyles, G. H. Swingler, A. Rodwell
1934-35	T. Millar, J. H. Gyles, G. H. Swingler, A. Rodwell

Note.—At the Thirteenth Convention the Rules and Constitution were amended to permit of Councils becoming members of the Association and to be represented on the Executive Council by two Councillor Members, hence the new layout of members of the Executive.

Councillors :

T. P. Gray, Johannesburg
J. McLean, Port Elizabeth
H. Middlebrook, Durban
T. P. Gray, Johannesburg
H. G. Capell, Durban
W. James, Cape Town
E. Spilkin, Umtata
W. James, Cape Town

Alternate Councillors :

1935-36:
H. W. Dely, Pretoria
1936-37:
F. Morrell, Cape Town
J. McLean, Port Elizabeth
1937-38:
H. Middlebrook, Durban
L. Hofmeyr, Stellenbosch
1938-39:
G. C. Starkey, East London
W. Fowkes, Cape Town

Engineers :

G. H. Swingler, Cape Town
J. H. Gyles, Durban
T. Millar, Harrismith
E. A. Behrens, Port Elizabeth
G. H. Swingler, Cape Town
T. Jagger, Ladysmith
E. A. Behrens, Port Elizabeth
G. M. Pirie, Bloemfontein
L. L. Horrell, Pretoria
J. S. Clinton, Salisbury
A. Q. Harvey, Springs
G. M. Pirie, Bloemfontein
D. J. Hugo, Pretoria
J. S. Clinton, Salisbury
A. Q. Harvey, Springs
G. M. Pirie, Bloemfontein

	1939-44:	D. J. Hugo, Pretoria C. Kinsman, Durban A. Q. Harvey, Springs G. M. Pirie, Bloemfontein W. N. Powell, Bloemfontein
E. Spilkin, Umtata C. Olley, Salisbury	G. C. Starkey, East London W. Fowkes, Cape Town	
	1944-45:	D. J. Hugo, Pretoria C. Kinsman, Durban J. C. Fraser, Johannesburg G. R. E. Wright, Benoni
H. H. Verity, Johannesburg C. Olley, Salisbury	H. E. Gearing, Cape Town R. M. Thomas, Durban	
	1945-46:	D. J. Hugo, Pretoria C. Kinsman, Durban J. C. Fraser, Johannesburg G. R. E. Wright, Benoni
J. Ohlsen, Bulawayo J. W. du Plessis, Bloemfontein	M. Jaffray, Salisbury E. Boylan, M.P.C., Johannesburg	
	1946-47:	D. J. Hugo, Pretoria J. C. Fraser, Johannesburg J. C. Downey, Springs D. A. Bradley, Port Elizabeth
P. J. C. du Plessis, M.P.C. (Bloemfontein) Major J. Raftery, J.P., M.P.C. (Durban)	A. Immink, Johannesburg A. Z. Berman, Cape Town	
	1947-48:	D. J. Hugo, Pretoria J. C. Fraser, Johannesburg J. C. Downey, Springs H. A. Eastman, Cape Town
Major J. Raftery, J.P., M.P.C. (Durban) E. H. Tiddy, East London	J. M. Preller, Pretoria C. G. Thompson, Johannesburg	
	1948-49:	D. J. Hugo, Pretoria J. C. Fraser, Johannesburg J. C. Downey, Springs H. A. Eastman, Cape Town
E. H. Tiddy, East London J. C. K. Erasmus, J.P., Port Elizabeth	C. G. Thompson, Johannesburg J. Johnston, Durban	
	1949-50:	J. C. Fraser, Johannesburg J. C. Downey, Springs H. A. Eastman, Cape Town G. J. Muller, Bloemfontein A. R. Sibson, Bulawayo J. L. van der Walt, Krugersdorp
J. C. K. Erasmus, J.P., Port Elizabeth C. E. (Sax) Young, Pietermaritzburg	W. F. du Plessis, Bloemfontein S. H. Millar, Bulawayo	
	1950-51:	

Note.—At the Twenty-Fourth Convention the Rules and Constitution were amended to permit of eight Council Members being elected to the Executive and that these Councillor Members shall be the Councillors of those towns whose Engineer Members (other than the two Past-Presidents) have been elected to the Executive Council.

As a result of this amendment the undermentioned constituted the Executive Council:—

Councils:		Engineers:
Pietermaritzburg	(Councillor C. E. Young)	C. R. Hallé
Springs	(Councillor L. P. Davies)	J. C. Downey
Bulawayo	(Councillor J. J. Wrathall)	A. R. Sibson
Bloemfontein	(Councillor W. F. du Plessis)	G. J. Muller
Cape Town	(Councillor J. Muller)	H. A. Eastman
Durban	(Councillor G. Hayward)	C. Kinsman
Krugersdorp	(Councillor E. B. Neill)	L. J. van der Walt
Johannesburg	(Councillor L. M. Weiner)	J. C. Fraser
		D. A. Bradley
		A. Foden

Councils: 1951/52:		Engineers:
Pretoria	C. W. Sinclair	J. C. Downey
East London	F. T. Fox	A. R. Sibson
Springs	L. P. Davies	A. Foden
Cape Town	Maj. J. W. O. Billingham	J. C. Fraser
Krugersdorp	Maj. H. Pannall	D. J. Hugo
Bulawayo	C. M. Newman	C. G. Downie
Durban	E. E. Cheek	C. Kinsman
Johannesburg	L. M. Weiner	J. L. van der Walt

Councils: 1952/53		Engineers:
Bloemfontein	E. B. Altona	G. J. Muller
Bulawayo	T. W. Gubb	A. R. Sibson
Cape Town	A. F. Keen	C. G. Downie
Durban	H. L. Richardson	C. Kinsman
Johannesburg	H. W. Harrison	J. C. Fraser
Krugersdorp	M. C. Dames	J. L. van der Walt
Port Elizabeth	L. Dubb	D. A. Bradley
Salisbury	A. Morton Jaffray	J. E. Mitchell

## RULES AND CONSTITUTION

ASSOCIATION OF  
**Municipal Electricity Undertakings**  
 OF SOUTHERN AFRICA

**1. TITLE**

The name of the Association shall be "The Association of Municipal Electricity Undertakings of Southern Africa."

**2. OBJECTS**

The objects for which the Association is formed are:—

- (a) To promote the interests of Municipal Electricity Undertakings.
- (b) To bring Municipal Electrical Engineers and Chairman and Members of Municipal Electricity Committees together.
- (c) To arrange and hold periodical meetings for the reading of papers and discussions of subjects appertaining to Municipal Electricity Undertakings.
- (d) To take such action as may be lawful and expedient for the protection and defence of the rights or interests of Municipal Electricity Undertakings.

**3. MEMBERSHIP**

The Association shall consist of:—

- (a) Honorary Members.
- (b) Councillor Members.
- (c) Engineer Members.
- (d) Associate Members.
- (e) Associates.

All Hon. Members and Members of the Association of Municipal Electrical Engineers shall *ipso facto* become Hon. Members and Engineer Members of the Association of Municipal Electricity Undertakings and existing Associate Members shall be eligible to transfer to the class of Associate.

**4. QUALIFICATIONS**

The qualifications for admission to the Association shall be as follows:—

- (a) **Honorary Members** shall be distinguished persons who are or who have been intimately connected with Municipal Electricity Undertakings and whom the Association especially desires to honour for exceptionally important services in connection therewith.
- (b) **Councillor Members.** The Member whose Chief Electrical Engineer shall have qualifications acceptable to the Council shall be the Committee appointed by the Municipality or Local Authority to have control over its Electricity Undertakings and shall be represented as regards its qualifications to vote by one member of such Committee.

- (c) **Engineer Members.** The Member shall be the Chief Electrical Engineer engaged on the permanent staff of an Electricity Undertaking owned by a Municipality or Local Authority and who has had a thorough training in electrical engineering and is otherwise acceptable to the Council of the Association. After 1st June, 1947, one only duly qualified assistant in an undertaking with sales of over 20,000,000 units per annum may also be admitted to this class on the recommendation of the Chief Electrical Engineer.
- (d) **Associate Members.** The Member shall be a Technical Assistant engaged on the permanent staff of any Electricity Undertaking represented by its Councillor Member and/or Engineer Member.
- (e) **Associates.** Any member resigning from the Class of Engineer Member or Associate Member shall be entitled to apply for transfer to the class of Associate. An Associate may also be an Engineer in the employ of an Authorised Electricity Undertaker other than a Local Authority who is engaged in the supply of electricity to consumers in the area of jurisdiction of a Local Authority.

**5. ADMISSION OF MEMBERS**

- (a) The election of Honorary Members and other classes shall be vested in the Council.
- (b) Councillor Members may be admitted on an application signed by the Town Clerk of the Municipality or Local Authority concerned.
- (c) Every candidate for election into the Association as Engineer Member shall make application on the prescribed form suitably endorsed by two supporters who shall be either Engineer Members, Councillor Members or Members of the Committee of the Municipal or Local Authority in charge of the Electricity Undertaking of which the applicant is Chief Electrical Engineer.
- (d) Every candidate for election into the Association as Associate Member or Associate shall make application on the prescribed form suitably endorsed by the Engineer Member on whose staff he is engaged.
- (e) Every candidate for transfer to the class of Associate shall make application in writing for transfer.

**6. CONTRIBUTIONS**

Contributions shall become due and payable annually on the 1st day of March which shall constitute the new financial year of the Association.

- (a) **Honorary Members** shall not be required to pay any contribution.

- (b) **Councillor Members.** In the case of the Committee appointed by a Municipality or Local Authority to have control over the Electricity Undertaking, the undermentioned scale of contributions shall apply:

## SCALE OF CONTRIBUTIONS

Up to	½ million units ...	...	4 guineas
½ "	1 "	" " " "	6 "
1 "	10 "	" " " "	8 "
10 "	50 "	" " " "	12 "
50 "	100 "	" " " "	14 "
100 "	200 "	" " " "	16 "
200 "	300 "	" " " "	18 "
Over	300 "	" " " "	20 "

- (c) **Engineer Members.** The contribution of an Engineer Member in the service of a Committee making a contribution shall merge into and form part of such contribution. When a Committee is not a Member or resigns from membership the Engineer Membership contribution shall be two (2) guineas.

- (d) **Associate Members and Associates.** The contribution of Associate Members or Associates shall be one (1) guinea.

**Part year contribution.** All members shall pay the contribution for the year in which they are elected without reference to the period of the year at which their election takes place and they shall be entitled to receive a copy of the Proceedings or any other publication issued during such year.

**Arrear Contribution.** No class of member whose contribution is six months in arrear shall be entitled to attend or take part in any of the meetings of the Association or to receive any of the Association's publications.

Any class of member whose contribution is in arrear at any Convention shall deem to have forfeited claim to membership and his name may, by the Council, be removed from the register of the Association, but he shall, nevertheless, be liable for such arrears up to the date of his name being removed.

## 7. COUNCIL

**Management.** The affairs of the Association shall be managed by the Council, who shall have power to incur any expenditure necessary for the objects of the Association.

**Members of the Council.** The Council shall consist of a President, Vice-President, two immediate Past-Presidents, all of whom shall be Engineer Members, six other Engineer Members and eight Councillor Members.

**Officers of Council.** The officers of the Council shall be President, Vice-President, Secretary and Treasurer.

**Election of Council.** The officers (other than the Secretary and Treasurer) and the Engineer

Members shall be elected by nomination and ballot at the Convention, and shall hold office until the next Convention. In the event of a vacancy occurring during the year, the remaining members shall have power to appoint a member to fill the vacancy. The Councillor Members shall be the Councillors of those towns whose Engineer Members (other than the two Past-Presidents) have been elected to the Executive Council.

**Co-option.** The Council shall have power to co-opt any members of the Association or other persons for any special purpose whose services in their opinion may advance the objects of the Association.

**Election of Secretary and Treasurer.** The Council shall appoint and from time to time determine the remuneration (if any) and prescribe the duties of the Secretary and Treasurer who shall hold office during the pleasure of the Council.

## 8. MEETINGS

**Council.** The Council shall meet as often as the business of the Association may require and at any meeting five shall constitute a quorum.

**Convention.** The Association shall hold Conventions yearly (of which the local Press of the town in which the Convention is held shall be given full particulars) as far as may be conveniently arranged, and at that meeting the Secretary and Treasurer shall present the Report and Balance Sheet of the Association for the immediate past period.

**Quorum.** At any meeting of the Association 15 shall form a quorum.

**Chairman.** The President shall take the chair at all meetings of the Association, the Council and the Committees, at which he is present, and shall regulate and keep order in the proceedings.

In the absence of the President, it shall be the duty of the Vice-President to preside at the meetings of the Association, and to regulate and keep order in the proceedings. But in the case of the absence of the President, and of the Vice-President, the meeting may elect any member of the Council or, in the case of their absence, any member present to take the chair at the meeting.

**Resolve into Committee.** The Association shall reserve to itself the right to resolve into Committee at any time during its proceedings; moreover, it shall be competent for any member to have his paper read and discussed in committee if he so desires.

**Sectional Voting.** When a motion is before any Convention or meeting of the Association it shall be competent for any member of either the Councillor or Engineer sections to apply to the Chairman for a "Vote by Section". This application shall be granted by the Chairman whereupon each of these sections shall vote separately on the motion and unless a majority shall be obtained in each section, the motion shall be lost. On a sectional vote being called for, Associate Members and Associates shall not be entitled to vote.

## MEMBERS, DELEGATES AND VISITORS ATTENDING THE 27th CONVENTION

ALBERTON	GRAAFF-REINET
Cr. G. L. Grewar	Cr. J. S. Pierce
M. W. Odendaal	A. H. Johnson
BEAUFORT WEST	GERMISTON
J. P. Mostert	Cr. S. J. Hattingh
BENONI	C. Lombaard
Cr. N. C. Korsman	HEIDELBERG
BETHAL	J. F. Lategan
M. N. Kirberger	HARRISMITH
BETHLEHEM	P. Bechler
Cr. J. H. Loubser	JOHANNESBURG
K. M. Fisher	Cr. W. H. Harrison
BLOEMFONTEIN	J. C. Fraser
Cr. G. A. Fichardt	R. W. Kane
G. J. Muller	R. Leishman
BOTHAVILLE	KEMPTON PARK
Cr. J. J. Reyniers	Cr. J. C. Kruger
J. D. Hattingh	L. Fitcher
BOKSBURG	KIMBERLEY
Cr. P. A. Venter, M.P.C.	Cr. L. Jawno
E. L. Smith	S. R. Irwin
BULAWAYO	KLERKSDORP
Cr. J. W. Phillips	J. M. Gericke
A. R. Sibson	KOKSTAD
BRAKPAN	W. G. Thackway
Cr. C. V. Ash	KROONSTAD
Cr. Dr. G. P. van Rooyen	Cr. F. J. Theron
Cr. I. M. v. R. Bakkes	W. Rossler
P. L. Vergottini	KRUGERSDORP
BRITS	Cr. M. C. Dames
J. de Wit	J. L. van der Walt
CAPE TOWN	LADYSMITH
Cr. A. F. Keen	Cr. F. O. Rapson
C. G. Downie	F. Stevens
CRADOCK	LOUIS TRICHARDT
A. Rossler	Cr. H. M. T. Reid
DELMAS	E. L. Buchanan
G. C. Delpont	LIVINGSTONE
DURBAN	K. B. Barlow
Cr. H. L. Richardson	MAFEKING
C. Kinsman	Cr. C. J. Truscott
DE AAR	G. E. H. Jones
J. A. Macques	MIDDELBURG, TVL.
EAST LONDON	N. A. Porgieter
Cr. J. P. W. Chapman	NELSPRUIT
A. Foden	R. R. Lyall
EDENVALE	NIGEL
Cr. F. J. Wagenaar	T. J. Millen
R. V. Bailey	ODTSHOORN
ESTCOURT	C. H. Adams
Cr. M. J. Moolman	ODENDAALSRUS
J. G. F. Erikson	J. S. van der Spuy
ERMELO	PARYS
P. C. Asselbergs	D. R. Pretorius
GEORGE	PIETERSBURG
P. H. Newcombe	Cr. W. H. Mitchell
GRAHAMSTOWN	J. I. Inglis
J. Iversch	PIETERMARITZBURG
GREYTOWN	Cr. C. E. K. Young
J. S. Craig	C. R. Hallé

## PORT ELIZABETH

Cr. A. Markman  
D. A. Bradley

## PORT SHEPSTONE

Cr. S. E. Jones  
K. W. J. Halliday

## POTCHEFSTROOM

Cr. P. J. Raubenheimer  
T. Kramer

## POTGIETERSRUST

P. J. Vorster

## PRETORIA

Cr. C. E. Acton  
D. J. Hugo  
J. Wilson

## QUEENSTOWN

Cr. E. W. Temlett  
V. E. O. Barratt

## RANDFONTEIN

Cr. P. Pretorius  
J. R. Cherry

## ROBERTSON

Cr. S. L. Muller  
S. de V. de Villiers

## ROODEPOORT-MARAISBURG

Cr. A. J. Renwick  
D. D. Brown

## RUSTENBURG

Cr. W. P. Anderson  
P. A. Meintjies

## SALISBURY

Cr. S. W. Sandford  
Cr. A. M. Jaffray  
J. E. Mitchell

## SOMERSET EAST

W. H. Atteridge

## SOMERSET WEST

Cr. R. C. Mackay  
F. P. W. Hall

## SPRINGS

Cr. R. H. W. Tainton  
J. C. Downey

## STANGER

J. L. McNeil

## STELLENBOSCH

Cr. H. Dwyer  
E. de C. Pretorius

## STANDERTON

Cr. D. J. Louw  
G. B. Heunis

## THE STRAND

C. N. Sims

## THEUNISSEN

J. C. van der Walt

## UMTALI

H. T. Turner

## UITENHAGE

Cr. T. R. Thompson  
J. A. Mathews

## UMTATA

F. R. Waldron

## UPINGTON

J. C. Strauss

## VEREENIGING

Cr. C. J. Shlebusch  
H. A. McIntyre

## VREDE

D. R. Verschoor

## VRYHEID

W. Rush

## WELKOM

R. W. Barton

## WESTONARIA

Cr. D. Gerson  
L. Dreyer

## WINDHOEK

G. S. Fainsinger

## WORCESTER

Cr. C. C. A. de Villiers  
W. C. Theron

## OTHER MEMBERS

C. R. Burton (Associate)  
R. D. Coulthard (Associate)  
L. L. Horrell (Hon. Member)  
W. N. Powell (Associate)

A. R. Campbell (Associate)  
D. J. R. Conradie (Associate)  
W. H. Milton (Associate)  
A. T. Rodwell (Hon. Member)

J. S. Clinton (Associate)  
H. A. Eastman (Hon. Member)  
H. M. S. Muller (Associate)  
G. C. Theron (Associate)

## DELEGATES

## GOVERNMENT DEPARTMENTS

## Electricity Supply Commission :

Dr. J. T. Hattingh (Chairman)  
R. de Villiers (Chief Electrical Engineer)  
J. M. Magowan (Southern Rhodesia)  
G. R. D. Harding, Joint Manager, Rand Undertaking.

## Other Departments :

L. Webster, Post and Telegraphs Department, Pretoria.  
J. J. de Haas, Public Works Department, Pretoria.  
R. N. F. Smit, Chief Inspector of Factories and Chairman, Electrical Wiremen's Registration Board.  
F. W. Joubert, Electricity Control Board.  
Dr. F. J. de Villiers, Chairman Standards Council.

## OTHER REPRESENTATIVES

J. W. Swardt, J. E. T. Cogley, J. T. Williams, S.A. Bureau of Standards.  
 P. J. Sorgedraeger, G. A. W. van Doorsum, Fuels Research Board.  
 C. Mullins, President, S.A. Institute of Electrical Engineers.  
 A. C. Backeberg, President, S.A. Institution of Mechanical Engineers.  
 W. B. Hutton, President, S.A. Institution of Certificated Engineers.  
 E. V. Perrow, Chairman, Safety Precautions Committee.  
 A. W. Lineker, Rand Water Board.

## VISITORS

S. G. Redman, T. R. J. Bishop, H. G. Hampson, J. G. Privitt, Merz & McLellan, Johannesburg, J. R. Beard, London, England.  
 C. H. Coutts, Chairman, Electrical & Allied Industries Association of S.A.  
 A. M. Jacobs, Consulting Engineer, Johannesburg.  
 Gerhard Herrman, African Transmission Construction Co. (Pty.) Ltd.  
 J. A. Bullen, Editor, Municipal Affairs.  
 M. Putman, District Inspector of Factories.  
 J. D. C. Baxter, Northern Cape Regional Electrification Board, Kimberley.  
 W. E. A. Norton, G. N. Hosking, J. Cox, A. C. Davidson, G. Pullk, T. Emmerson, Electricity Department, Johannesburg.  
 E. Bartleet, J. W. Matthews, Treasury Department, Johannesburg.

## REPRESENTATIVES—ENGINEERING COMPANIES

Aberdare Cables of S.A. Ltd. ... ..	Sir George Usher, R. J. Bates, G. McL. Yuill.
African Cables Ltd. ... ..	H. G. Sale.
Arthur Trevor Williams (Pty.) Ltd. ... ..	A. Trevor Williams, J. A. Barnett.
Allenwest (S.A.) Ltd. ... ..	E. Nicholas.
Aluminium Co. of S.A. Pty. Ltd. ... ..	F. G. McDonald.
Bartle & Co. ... ..	M. G. Wicks, J. M. Emery.
British Thomson-Houston Co. (S.A.) (Pty.) Ltd. ... ..	L. G. Aze, N. R. Yorke.
Babcock & Wilcox of Africa Ltd. ... ..	K. M. Johnston, J. S. Woosley, J. Callie.
British Insulated Cables Ltd. ... ..	A. L. Sanders, J. Russell.
Brush Aboe (S.A.) Ltd. ... ..	P. N. Vickerman
British General Electric Co. Ltd. ... ..	H. Littlewood.
Caltex (Africa) Ltd. ... ..	J. Curstems, W. H. Scharges.
Chloride Electrical Storage Co. (S.A.) (Pty.) Ltd. ... ..	A. C. Tilley.
Contactar (Pty.) Ltd. ... ..	H. D. James.
Cooper & de Beer (Pty.) Ltd. ... ..	C. L. de Beer.
Dowson & Dobson Ltd. ... ..	J. R. Wheating.
Enfield Cables (S.A.) (Pty.) Ltd. ... ..	A. E. Torrance, B. E. Webb.
English Electric Co. (S.A.) Ltd. ... ..	H. J. H. Nethersole.
Falks Electrical Supplies (S.A.) (Pty.) Ltd. ... ..	R. C. Viviers.
General Motors South African Ltd. ... ..	R. T. Park, G. Withers.
Hubert Davies & Co. ... ..	L. H. Pistorius, J. Russell.
James Howden & Co. Africa (Pty) Ltd. ... ..	W. Downie.
Heinemann Electric (S.A.) Ltd. ... ..	G. A. Dalton.
International Combustion Africa Ltd. ... ..	G. R. Usher, Q. R. Nothard.
Johnson & Phillips S.A. (Pty.) Ltd. ... ..	E. W. Dixon, F. H. Tyler.
George Kent S.A. (Pty.) Ltd. ... ..	H. B. Hichens.
Harold Marthinussen & Co. (Pty.) Ltd. ... ..	H. Marthinussen, G. Rocske.
Metropolitan-Vickers S.A. (Pty.) Ltd. ... ..	D. W. Stanley.
North & Robertson (Pty.) Ltd. ... ..	W. D. Robertson
Patrick Murray (Pty.) Ltd. ... ..	W. H. Walsh.
C. A. Parsons & Co. S.A. (Pty.) Ltd. ... ..	H. M. Rochester, T. R. Strawson.
Reunert & Lenz Ltd. ... ..	C. F. Robinson, E. J. McKechnie.
Reynolds & Co. Ltd. ... ..	W. J. Gibbons.
Rice & Diethelm Ltd. ... ..	R. E. C. Hughes.
Scottish Cables (S.A.) Ltd. ... ..	A. C. Grant, W. E. L. Tonkinson.
S.A. Cable Makers Association ... ..	E. R. J. Smith.
S.A. Electrical Review ... ..	R. N. Stevens-Burt.
S.A. General Electric Co. Ltd. ... ..	E. Crole.
Stamcor (Pty.) Ltd. ... ..	J. M. Taylor.
Stewarts & Lloyds of S.A. Ltd. ... ..	E. C. Enfield, T. A. Robinson.
Shell Co. of S.A. Ltd. ... ..	G. Phillips, I. H. G. Nicholson.
Simplex Electric Co. (S.A.) (Pty.) Ltd. ... ..	J. A. Morrison, C.C.R. Watkins.
Samuel Osborne (S.A.) Ltd. ... ..	V. A. Bright.
R. T. Urquhart & Co. (Pty.) Ltd. ... ..	R. T. Urquhart.
Waygood-Otis (S.A.) Ltd. ... ..	J. A. Black.
Wilson & Herd Ltd. ... ..	R. W. Hayman.
Yarrow Africa (Pty.) Ltd. ... ..	H. D. T. Harris.

## LADIES

Mrs. C. E. Acton, Pretoria.  
 Mrs. C. H. Adams, Oudtshoorn  
 Mrs. W. H. Attridge, Somerset West.  
 Mrs. L. G. Axe, Johannesburg.  
 Mrs. R. V. Bailey, Edenvale.  
 Mrs. K. B. Barlow, Livingstone.  
 Mrs. J. A. Barnett, Johannesburg.  
 Mrs. R. J. Bates, Port Elizabeth.  
 Mrs. J. D. C. Baxter, Kimberley.  
 Mrs. J. R. Beard, London.  
 Mrs. T. R. J. Bishop, Johannesburg.  
 Mrs. D. A. Bradley, Port Elizabeth.  
 Mrs. V. A. Bright, Johannesburg.  
 Mrs. E. L. Buchanan, Louis Trichardt.  
 Mrs. C. R. Buston, Kimberley.  
 Mrs. J. Callie, Johannesburg.  
 Mrs. A. R. Campbell, Johannesburg.  
 Mrs. J. Carstairs, Johannesburg.  
 Mrs. J. R. Cherry, Randfontein.  
 Mrs. J. S. Clinton, Johannesburg.  
 Mrs. D. J. R. Conradie, Bloemfontein.  
 Mrs. R. D. Coulthard, Pietermaritzburg.  
 Mrs. E. Crole, Johannesburg.  
 Mrs. G. A. Dalton, Johannesburg.  
 Mrs. C. L. de Beer, Johannesburg.  
 Mrs. C. C. A. de Villiers, Worcester.  
 Mrs. S. de V. de Villiers, Robertson.  
 Mrs. E. W. Dixon, Johannesburg.  
 Mrs. C. G. Downie, Cape Town.  
 Mrs. W. Downie, Johannesburg.  
 Mrs. J. C. Downey, Springs.  
 Mrs. H. Dwyer, Stellenbosch.  
 Mrs. H. A. Eastman, Somerset West.  
 Mrs. J. M. Emery, Johannesburg.  
 Mrs. E. C. Enfield, Johannesburg.  
 Mrs. J. G. F. Erikson, Estcourt.  
 Mrs. K. M. Fisher, Bethlehem.  
 Mrs. A. Foden, East London.  
 Mrs. J. C. Fraser, Johannesburg.  
 Mrs. L. Fitcher, Kempton Park.  
 Mrs. W. J. Gibbons, Johannesburg.  
 Mrs. A. C. Grant, Johannesburg.  
 Mrs. G. L. Grewar, Alberton.  
 Mrs. F. P. W. Hall, Somerset West.  
 Mrs. K. W. J. Halliday, Port Shepstone.  
 Mrs. H. D. T. Harris, Johannesburg.  
 Mrs. J. D. Hattingh, Bothaville.  
 Mrs. S. J. Hattingh, Germiston.  
 Mrs. R. W. Hayman, Johannesburg.  
 Mrs. G. Hermann, Johannesburg.  
 Mrs. G. N. Hosking, Johannesburg.  
 Mrs. D. J. Hugo, Pretoria.  
 Mrs. J. I. Inglis, Pietersburg.  
 Mrs. A. M. Jeffray, Salisbury.  
 Mrs. H. D. James, Johannesburg.  
 Mrs. K. M. Johnston, Johannesburg.  
 Mrs. G. E. H. Jones, Mafeking.  
 Mrs. R. W. Kane, Johannesburg.  
 Mrs. C. Kinsman, Durban.  
 Mrs. M. N. Kirberger, Bethal.  
 Mrs. M. C. Kotsman, Benoni.  
 Mrs. T. Kramer, Potchefstroom.

Mrs. R. Leishman, Johannesburg.  
 Mrs. H. Littlewood, Johannesburg.  
 Mrs. C. Lombard, Germiston.  
 Mrs. J. H. Loubser, Bethlehem.  
 Mrs. R. C. Mackay, Somerset West.  
 Mrs. E. J. McKechnie, Johannesburg.  
 Mrs. J. L. McNeil, Stanger.  
 Mrs. G. McL. Yuill, Johannesburg.  
 Mrs. H. Miller (Mayoress), Johannesburg.  
 Mrs. W. H. Milton, Johannesburg.  
 Mrs. J. E. Mitchell, Salisbury.  
 Miss J. Mitchell, Salisbury.  
 Mrs. M. J. Moolman, Estcourt.  
 Mrs. J. A. Morrison, Springs.  
 Mrs. J. P. Mostert, Beaufort West.  
 Mrs. H. M. S. Muller, Upington.  
 Mrs. J. Nethersole, Johannesburg.  
 Mrs. W. Nicol, Pretoria.  
 Mrs. Q. R. Nothard, Johannesburg.  
 Mrs. M. W. Odendaal, Alberton.  
 Mrs. E. V. Perrow, Johannesburg.  
 Mrs. J. W. Phillips, Bulawayo.  
 Mrs. P. Pretorius, Randfontein.  
 Mrs. F. O. Rapson, Ladysmith.  
 Mrs. H. Reid, Louis Trichardt.  
 Mrs. T. A. Robinson, Johannesburg.  
 Mrs. A. Rodwell, Johannesburg.  
 Mrs. G. Roeske, Johannesburg.  
 Mrs. A. Rossler, Cradock.  
 Mrs. W. Rossler, Kroonstad.  
 Mrs. H. G. Sale, Johannesburg.  
 Mrs. A. R. Sibson, Bulawayo.  
 Miss S. Sibson, Bulawayo.  
 Mrs. E. L. Smith, Boksburg.  
 Mrs. E. R. J. Smith, Johannesburg.  
 Mrs. D. W. Stanley, Johannesburg.  
 Mrs. F. Stevens, Ladysmith.  
 Mrs. R. H. W. Tainton, Springs.  
 Mrs. A. T. Taylor, Johannesburg.  
 Mrs. J. M. Taylor, Johannesburg.  
 Mrs. F. G. Theron, Kroonstad.  
 Mrs. G. C. Theron, Vanderbijl Park.  
 Mrs. W. C. Theron, Worcester.  
 Mrs. A. C. Tilley, Johannesburg.  
 Mrs. C. J. Truscott, Mafeking.  
 Mrs. F. H. Tyler, Johannesburg.  
 Lady Usher, Port Elizabeth.  
 Mrs. R. T. Urquhart, Johannesburg.  
 Mrs. J. S. van der Spuy, Odendaalsrus.  
 Mrs. P. L. Vergottini, Brakpan.  
 Mrs. D. R. Verschoor, Vrede.  
 Mrs. P. N. Vickerman, Johannesburg.  
 Mrs. P. J. Vorster, Potgietersrust.  
 Mrs. F. J. Wagenaar, Edenvale.  
 Mrs. W. H. Walsh, Durban.  
 Mrs. C. C. R. Watkins, Springs.  
 Mrs. J. R. Wheatling, Johannesburg.  
 Mrs. M. G. Wicks, Johannesburg.  
 Mrs. A. Trevor Williams, Johannesburg.  
 Mrs. J. T. Williams, Pretoria.  
 Mrs. J. S. Woosley, Johannesburg.  
 Mrs. N. R. Yorke, Johannesburg.



## LIST OF MEMBERS AS AT 31st MAY, 1953

## HONORARY MEMBERS

- Dobson, Dr. J. H., 35 Central Avenue, Illovo, Johannesburg.  
 Eastman, H. A. Torwood, Parel Vallei, Somerset West, C.P.  
 Horrel, L. L., 139 Brook Street, Brooklyn, Pretoria.  
 Poole, E., 3 Musgrave Mansions, 690 Musgrave Road, Durban.  
 Redwell, A. T., "Miranda", Oxford Road, Parktown, Johannesburg.

## COUNCIL MEMBERS

- Adelaide, C.P., Municipality, P.O. Box 38.  
 Alwal North, C.P., Municipality, P.O. Box 46.  
 Alberton, Tvl., Municipality, P.O. Box 4.  
 Barberton, Tvl., Municipality, P.O. Box 33.  
 Beaufort West, C.P., Municipality, P.O. Box 9.  
 Benoni, Tvl., Municipality, P.O. Box 45.  
 Bethal, Tvl., Municipality, P.O. Box 3.  
 Bethlehem, O.F.S., Municipality, P.O. Box 130.  
 Bloemfontein, O.F.S., City Council, P.O. Box 288.  
 Boksburg, Tvl., Town Council, P.O. Box 215.  
 Brandfort, O.F.S., Municipality, P.O. Box 13.  
 Bulawayo, S.R., City Council, P.O. Box 591.  
 Butterworth, Transkei, Municipality, P.O. Box 36.  
 Brakpan, Tvl., Town Council, P.O. Box 15.  
 Brits, Tvl., Town Council, P.O. Box 106.  
 Bothaville, O.F.S., Municipality, P.O. Box 12.  
 Cape Town, C.P., City Council, P.O. Box 298.  
 Cradock, C.P., Municipality, P.O. Box 24.  
 Ceres, C.P., Municipality, P.O. Box 44.  
 Delmas, Tvl., Village Council, P.O. Box 6.  
 Durban, Natal, City Council, P.O. Box 147.  
 East London, C.P., City Council, P.O. Box 134.  
 Elliot, C.P., Municipality, P.O. Box 21.  
 Ermelo, Tvl., Municipality, P.O. Box 48.  
 Eshowe, Zululand, Town Board, P.O. Box 37.  
 Edenvale, Tvl., Town Council, P.O. Box 25.  
 Estcourt, Natal, Borough, P.O. Box 15.  
 Fort Beaufort, C.P., Municipality, P.O. Box 36.  
 Ficksburg, O.F.S., Municipality, P.O. Box 116.  
 Gatooms, S.R., Municipality, P.O. Box 114.  
 George, C.P., Municipality, P.O. Box 28.  
 Grahamstown, C.P., City Council, P.O. Box 176.  
 Greytown, Natal, Borough, P.O. Box 71.  
 Gwelo, S.R., Municipality, P.O. Box 278.  
 Graaff-Reinet, C.P., Municipality, P.O. Box 71.  
 Germiston, Tvl., City Council, P.O. Box 145.  
 Harrismith, O.F.S., Municipality, P.O. Box 43.  
 Heidelberg, Tvl., Municipality, P.O. Box 201.  
 Kimberley, C.P., City Council.  
 Klerksdorp, Tvl., Municipality, P.O. Box 160.  
 Kokstad, E.G., Municipality, P.O. Box 8.  
 Kroonstad, O.F.S., Municipality, P.O. Box 302.  
 Krugersdorp, Tvl., Municipality, P.O. Box 94.  
 Komgha, C.P., Municipality, P.O. Box 21.  
 Kempton Park, Tvl., Municipality, P.O. Box 13.  
 Ladysmith, Natal, Borough, P.O. Box 29.  
 Louis Trichardt, Tvl., Municipality, P.O. Box 96.  
 Livingstone, N.R., Municipality, P.O. Box 29.  
 Ladybrand, O.F.S., P.O. Box 64.  
 Mafeking, Bech'J., Municipality, P.O. Box 42.  
 Marietale, E.G., Municipality, P.O. Box 35.  
 Middelburg, C.P., Municipality, P.O. Box 55.  
 Middelburg, Tvl., Municipality, P.O. Box 14.  
 Nelspruit, Tvl., Municipality, P.O. Box 45.  
 Newcastle, Natal, Borough, P.O. Box 21.  
 N'Dola, N.R., Municipality, P.O. Box 197.  
 Nigel, Tvl., Municipality, P.O. Box 23.  
 Oudtshoorn, C.P., Municipality, P.O. Box 132.  
 Odendaalsrus, O.F.S., Municipality, P.O. Box 21.  
 Paarl, C.P., Municipality, P.O. Box 12.  
 Pietersburg, Tvl., Municipality, P.O. Box 111.  
 Pietermaritzburg, Natal, City Council, P.O. Box 321.  
 Piet Retief, Tvl., Municipality, P.O. Box 23.  
 Port Alfred, C.P., Municipality.  
 Port Elizabeth, C.P., City Council, P.O. Box 116.  
 Port Shepstone, Natal, Borough, P.O. Box 5.  
 Potchefstroom, Tvl., Municipality, P.O. Box 113.  
 Potgietersrus, Tvl., Municipality, P.O. Box 34.  
 Pretoria, Tvl., City Council, P.O. Box 440.  
 Parys, O.F.S., Municipality, P.O. Box 39.  
 Queenstown, C.P., Municipality, P.O. Box 113.  
 Que Que, S.R., Municipality, P.O. Box 15.  
 Randfontein, Tvl., Municipality, P.O. Box 139.  
 Robertson, C.P., Municipality, P.O. Box 52.  
 Roodepoort-Marisburg, Tvl., Municipality, P.O. Box 217, Roodepoort.  
 Rustenburg, Tvl., Municipality, P.O. Box 16.  
 Salisbury, S.R., City Council, P.O. Box 990.  
 Somerset East, C.P., Municipality, P.O. Box 21.  
 Springs, Tvl., Town Council, P.O. Box 45.  
 Springfontein, O.F.S., Municipality, P.O. Box 10.  
 Stanger, Natal, Borough, P.O. Box 72.  
 Stellenbosch, C.P., Municipality, P.O. Box 17.  
 Somerset West, C.P., Municipality, P.O. Box 19.  
 Standerton, Tvl., Municipality, P.O. Box 66.  
 The Strand, C.P., Municipality, P.O. Box 3.  
 Theunissen, O.F.S., Municipality, P.O. Box 8.  
 Uitenhage, C.P., Municipality, P.O. Box 45.  
 Umtata, Tembuland, Municipality, P.O. Box 57.  
 Umtali, S.R., Municipality, P.O. Box 121.  
 Uptington, C.P., Municipality, P.O. Box 17.  
 Vereeniging, Tvl., Municipality, P.O. Box 35.  
 Vrede, O.F.S., Municipality, P.O. Box 155.  
 Vryburg, C.P., Municipality.  
 Vryheid, Natal, Borough, P.O. Box 57.  
 Ventersdorp, Tvl., Municipality, P.O. Box 15.  
 Walmer, C.P., Municipality, Town Hall, Walmer.  
 Winburg, O.F.S., Municipality, P.O. Box 26.  
 Windhoek, S.W.A., Municipality, P.O. Box 59.  
 Willowmore, C.P., Municipality, P.O. Box 15.  
 Worcester, C.P., Municipality, P.O. Box 37.  
 Wepener, O.F.S., Municipality, P.O. Box 31.  
 Westonaria, Tvl., Municipality, P.O. Box 19.  
 Welkom, O.F.S., Village Board, P.O. Box 215.

## ENGINEER MEMBERS

- Aalbers, G., Municipal Electrical Engineer, P.O. Box 44, Ceres, C.P.  
 Adams, C. H., Municipal Electrical Engineer, P.O. Box 255, Oudtshoorn, C.P.  
 Anderson, F., Municipal Engineer, Port Alfred, C.P.  
 Asselbergs, P. C., Town Electrical Engineer, P.O. Box 48, Ermelo, Transvaal.  
 Atteridge, W. H., Municipal Electrical Engineer, P.O. Box 21, Somerset East, C.P.  
 Bahr, H., Municipal Electrical and Waterworks Engineer, P.O. Box 15 Ventersdorp, Tvl.  
 Bailey, R. V., Town and Electrical Engineer, P.O. Box 25, Edensvale, Tvl.  
 Barlow, K. B., Town Electrical Engineer, P.O. Box 109, Livingstone, N.R.  
 Barratt, V. E. O., Municipal Electrical Engineer, P.O. Box 113, Queenstown, C.P.  
 Bechler, P., Town Electrical Engineer, P.O. Box 43, Harrismith, O.F.S.  
 Bradley, D. A., City Electrical Engineer, P.O. Box 369, Port Elizabeth, C.P.  
 Brown, D. D., Municipal Electrical Engineer, P.O. Box 217, Roodepoort, Tvl.  
 Barton, R. W., Municipal Electrical Engineer, P.O. Box 20, Welkom, O.F.S.  
 Buchanan, E. L., Town Electrical Engineer, P.O. Box 96, Louis Trichardt, Tvl.  
 Cherry, J. R., Municipal Electrical Engineer, P.O. Box 139, Randfontein, Tvl.  
 Coetzee, F. J., Municipal Electrical Engineer, P.O. Box 42, Despatch, C.P.  
 Cowley, B. W., Municipal Electrical Engineer, P.O. Box 33, Barberton, Tvl.  
 Craig, J. S., Borough Electrical Engineer, P.O. Box 71, Greytown, Natal.  
 Delpoort, G. C., Municipal Electrical Engineer, P.O. Box 6, Delmas, Tvl.  
 de Wet, D. P., Municipal Electrical Engineer, P.O. Box 15, Willowmore, C.P.  
 de Wit, T., Engineer-in-Charge, Municipality of Brits, P.O. Box 106, Brits, Tvl.  
 Downey, J. C., Town Electrical Engineer, P.O. Box 45, Springs, Tvl.  
 Downie, C. G., City Electrical Engineer, P.O. Box 82, Cape Town, C.P.  
 Dreyer, D. v. s., Town Electrical Engineer, P.O. Box 13, Brandfont, O.F.S.  
 Dreyer, L., Municipal Electrical Engineer, P.O. Box 19, Westonaria, Tvl.  
 Dwyer, C. H., Borough Electrical Engineer, P.O. Box 72, Stanger, Natal.  
 du Toit, A. A., Municipal Electrical Engineer, P.O. Box 35 Vryburg, C.P.  
 Erikson, J. G. F., Borough Electrical Engineer, P.O. Box 15, Estcourt, Natal.  
 Fainsinger, G. S., Municipal Electrical Engineer, P.O. Box 59, Windhoek, S.W.A.  
 Fisher, K. M., Municipal Electrical Engineer, P.O. Box 551, Bethlehem, O.F.S.  
 Foden, A., City Electrical Engineer, P.O. Box 529, East London, C.P.  
 Fraser, J. C., General Manager, Electricity Department, P.O. Box 699, Johannesburg, Tvl.  
 Futscher, L., Municipal Electrical Engineer, P.O. Box 13, Kempton Park, Tvl.  
 Gericke, J. M., Municipal Electrical Engineer, P.O. Box 99, Klerksdorp.  
 Giles, P. A., Assistant City Electrical Engineer, P.O. Box 529, East London, C.P.  
 Grandin, P. C., Municipal Electrical Engineer, P.O. Box 114, Gatooma, S.R.  
 Gripper, H. J., Assistant City Electrical Engineer, P.O. Box 369, Port Elizabeth, C.P.  
 Hadfield, A. W. K., Town and Electrical Engineer, P.O. Box 278, Gwelo, S.R.  
 Halliday, K. W. J., Municipal Electrical Engineer, P.O. Box 5, Port Shepstone, Natal.  
 Hall, C. R., City Electrical Engineer, P.O. Box 399, Pietermaritzburg, Natal.  
 Hall, F. P. W., Municipal Electrical Engineer, P.O. Box 19, Somerset West, C.P.  
 Hattingh, J. D., Municipal Electrical Engineer, P.O. Box 12, Bothaville, O.F.S.  
 Heese, J. F., Municipal Electrical Engineer, P.O. Box 17, Upington, C.P.  
 Hugo, D. J., City Electrical Engineer, P.O. Box 423, Pretoria, Tvl.  
 Inglis, J. I., Town Electrical and Water Engineer, P.O. Box 111, Pietersburg, Tvl.  
 Iverach, J., City Electrical Engineer, P.O. Box 176, Grahamstown, C.P.  
 Jones, G. E. H., Municipal Electrical Engineer, P.O. Box 42, Mafeking, Bechuanaland.  
 Kane, R. W., Assistant General Manager, Electricity Department, P.O. Box 699, Johannesburg.  
 Kinsman, C., City Electrical Engineer, P.O. Box 147, Durban, Natal.  
 Kramer, T., Municipal Electrical Engineer, P.O. Box 113, Potchefstroom, Tvl.  
 Krüger, M. N., Town Engineer, P.O. Box 3, Bethal, Tvl.  
 Kruger, M. J. C., Municipal Electrical Engineer, P.O. Box 10, Butterworth, Transkei.  
 Leishman, R., Chief Engineering Assistant, Electricity Department, P.O. Box 699, Johannesburg.  
 Litegan, J. F., Town Electrical Engineer, P.O. Box 201, Heidelberg, Tvl.  
 Lombard, C., City Electrical Engineer, P.O. Box 145, Germiston, Tvl.  
 Lyall, R. R., Municipal Electrical Engineer, P.O. Box 45, Nelspruit, Tvl.  
 Macques, J. A., Municipal Electrical Engineer, Municipal Offices, De Aar, C.P.  
 Mathews, J. A., Municipal Electrical Engineer, P.O. Box 45, Uitenhage, C.P.  
 Meintjies, P. A., Municipal Electrical Engineer, P.O. Box 16, Rustenburg, Tvl.  
 Millen, T. J., Municipal Electrical Engineer, P.O. Box 23, Nigel, Tvl.  
 Mitchell, J. E., City Electrical Engineer, P.O. Box 73, Salisbury, S.R.  
 Mocke, T. M., Town and Electrical Engineer, P.O. Box 23, Piet Retief, Tvl.  
 Muller, G. J., City Electrical Engineer, P.O. Box 288, Bloemfontein, O.F.S.  
 Newcombe, P. H., Municipal Electrical Engineer, P.O. Box 28, George, C.P.  
 Nicholas, L. J., Municipal Electrical Engineer, P.O. Box 57, Umtata, Transkei.  
 Potgieter, N. A., Municipal Electrical Engineer, P.O. Box 14, Middelburg, Tvl.  
 Pretorius, D. R., Town Electrical Engineer, P.O. Box 39, Parys, O.F.S.  
 Pretorius, E. de C., Municipal Electrical Engineer, P.O. Box 17, Stellenbosch, C.P.  
 Prevost, H. A., Municipal Electrical Engineer, P.O. Box 21, Somerset East, C.P.  
 Redman, R. H., Deputy City Electrical Engineer, P.O. Box 1803, Bulawayo.

## ENGINEER MEMBERS—(Continued)

- Relihan, H. J., Municipal Electrical Engineer, P.O. Box 12, Paarl, C.P.  
 Reveneke, G. M., Town Electrical Engineer, P.O. Box 10, Springfontein, O.F.S.  
 Roberts, L. J., Municipal Electrical Engineer, P.O. Box 35, Matatiele, E.G.  
 Rogers, J., Municipal Electrical Engineer, P.O. Box 36, Fort Beaufort, C.P.  
 Rooode, L., Town and Electrical Engineer, P.O. Box 34, Potgietersrus, Tvl.  
 Rossler, A., Municipal Electrical Engineer, P.O. Box 24, Cradock, C.P.  
 Rossler, W., Town Electrical Engineer, P.O. Box 302, Kroonstad, O.F.S.  
 Rush, W., Borough Engineer, P.O. Box 57, Vryheid, Natal.  
 Robson, K. G., Town Electrical and Waterworks Engineer, P.O. Box 46, Aliwal North, C.P.  
 Rozendal, D., Municipal Electrical Engineer, P.O. Box 31, Wepener, O.F.S.  
 Sibson, A. R., City Electrical Engineer, P.O. Box 1803, Bulawayo, S.R.  
 Sims, C. N., Municipal Electrical Engineer, P.O. Box 3, The Strand, C.P.  
 Smith, E. L., Municipal Electrical Engineer, P.O. Box 215, Bokaburg, Tvl.  
 Smith, M. M., Municipal Electrical Engineer, P.O. Box 38, Adelaide, C.P.  
 Stevens, F., Borough Electrical Engineer, P.O. Box 56, Ladysmith, Natal.  
 Thackwray, W. G., Town Electrical Engineer, P.O. Box 8, Kokstad, E.G.  
 Theron, W. C., Municipal Electrical Engineer, P.O. Box 37, Worcester, C.P.  
 Turner, H. T., Town and Electrical Engineer, P.O. Box 121, Umtali, S.R.  
 Turnbull, A. F., Town Electrical Engineer, P.O. Box 35, Vereeniging, Tvl.  
 Van der Walt, J. L., Town Electrical Engineer, P.O. Box 94, Krugersdorp, Tvl.  
 Van der Spuy, J., Town Electrical Engineer, P.O. Box 21, Odendaalsrus, O.F.S.  
 Vergottini, P. L., Municipal Electrical Engineer, P.O. Box 15, Brakpan, Tvl.  
 Verschoor, D. R., Town and Electrical Engineer, P.O. Box 155, Vrede, O.F.S.  
 White, J. H., Municipal Electrical Engineer, P.O. Box 197, N'Dola, N.R.  
 Wilson, J., Assistant City Electrical Engineer, P.O. Box 423, Pretoria, Tvl.  
 Woolridge, W. E. L., Town Electrical Engineer, P.O. Box 24 Harding, Natal.  
 Williams, A. H., Assistant Electrical Engineer, P.O. Box 45, Springs, Tvl.  
 Ward, H. V., Municipal Electrical Engineer, Municipal Offices, Walmer, C.P.

## ASSOCIATES

- Andrew, W. M., c/o E. S. C., P.O. Box 667, East London, C.P.  
 Ashley, T. P., Electricity House, P.O. Box 1803, Bulawayo, S.R.  
 Bellad-Ellis, W., P.O. Box 255, East London.  
 Burton, C. R., 54 Memorial Road, Kimberley, C.P.  
 Campbell, A. R., P.O. Box 584, Johannesburg.  
 Clinton, J. S., P.O. Box 4648, Johannesburg.  
 Coulthard, R. D., "Hadleydene," 98 Jesmond Road, Pietermaritzburg, Natal.  
 Conradie, D. J. R., P.O. Box 1009, Bloemfontein, O.F.S.  
 Dalton, G. A., 111 Eckstein Street East, Observatory Extension, Johannesburg, Tvl.  
 Dawson, C., Electricity Supply Commission, P.O. Box 2408, Durban.  
 Ewer, Col. G. G., 174 Edmonds Road, Durban, Natal.  
 Ferreira, N., Town Engineer, P.O. Box 21, Coalbrook, O.F.S.  
 Foley, C. B., c/o Electrical Engineer, P.O. Box 35, Vereeniging, Tvl.  
 Gyles, J. H., P.O. Gillerts, Natal.  
 Heasman, G. G., P.O. Box 77, Fort Victoria, S.R.  
 Lloyd, R. K., Post Restante, Lusaka, N.R.  
 Lutsch, W. I. F. S., c/o Faculty of Engineering, University of Stellenbosch, C.P.  
 Marchand, B., P.O. Box 223, Witbank, Tvl.  
 McIntyre, H. A., Assistant Electrical Engineer, P.O. Box 35, Vereeniging, Tvl.  
 Mercier, G., P.O. Box 377, Salisbury, S.R.  
 Millin, D. R., Kongola Phiri Estate, P.O. Fort Manning, Nyasaland.  
 Milton, W. H., P.O. Box 1091, Johannesburg.  
 Mole, E. W., P.O. Box 3386, Johannesburg.  
 Muller, H. M. S., P.O. Box 112, Uppington, C.P.  
 Powell, W. N., 104 Marlene Mansions, Abel Road, Berea, Johannesburg.  
 Phillips, J. W., P.O. Box 1731, Bulawayo, S.R.  
 Simpson, H. G., Engineering Department, Searles Ltd., Great Brak River, C.P.  
 Theron, G. C., P.O. Box 1, Vanderbijl Park, Transvaal.  
 Tubb, B. H. T., P.O. Box 1699, Salisbury, S.R.  
 West, J. A., "Edgerton," P.O. Box 24, St. Michael's, South Coast, Natal.  
 Wright, G. R. E., P.O. Box 465, Benoni, Tvl.  
 Williams, J. T., P.O. Box 1617, Pretoria.  
 Williams, V. E., c/o Merz & McLellan, P.O. Box 606, Kimberley, C.P.  
 Waldron, F. R., Assistant Electrical Engineer, P.O. Box 57, Umtata, Tembuland.  
 Wylie, R. J. S., c/o E.S.C., Rand Undertaking, P.O. Box 103, Germiston, Tvl.

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

**AGENDA AND PROGRAMME**

**27th ANNUAL CONVENTION**

to be held in the

**SELBORNE HALL, JOHANNESBURG**

from the

**21st to 24th APRIL, 1953**

**DIE VERENIGING VAN MUNISPALE  
ELEKTRISITEITSONDERNEMINGS  
VAN SUIDELIKE AFRIKA**

**AGENDA EN PROGRAM**

**DIE 27ste JAARKONFERENSIE**

wat vanaf

**21 tot 24 APRIL 1953**

in die

**SELBORNESAAL, JOHANNESBURG**

gehou word

**AGENDA**

1. Election of President.
2. Venue of next Convention.
3. Election of Vice President, Executive Council, Subcommittees and representatives.
4. Annual report of Secretary and Treasurer.
5. Retiring President's Valedictory address.
6. Presidential address.
7. Reports of Subcommittees and Representatives.
  - (i) World Power Conference.
  - (ii) Electrical Wiresmen's Registration Board.
  - (iii) Registration of Electrical Wiring Contractors.
  - (iv) S.A. Bureau of Standards.
  - (v) Meter Testing Code.
  - (vi) Safety Precautions Committee.
  - (vii) Overhead lines code of Practice.
  - (viii) Coal Supplies.
  - (ix) Amendments to Constitution.
8. Appointment of Auditors.

**RETIRING OFFICERS**

President: A. R. SIBSON, Bulawayo.

Vice President: J. C. FRASER, Johannesburg.

Past Presidents: J. C. DOWNEY, Springs.

C. R. HALLE, Pietermaritzburg.

Councillor Members: Bloemfontein, Bulawayo, Cape Town, Durban, Johannesburg, Krugersdorp, Port Elizabeth and Salisbury.

Note.—The Town is elected and not the individual Councillors.

Other Members: D. A. BRADLEY, Port Elizabeth; C. G. DOWNIE, Cape Town; C. KINSMAN, Durban; J. E. MITCHELL, Salisbury; G. J. MULLER, Bloemfontein; J. L. VAN DER WALT, Krugersdorp.

**MEMBERS OF SUB-COMMITTEES AND REPRESENTATIVES**

Coal Supplies: C. G. DOWNIE (Convenor), D. A. BRADLEY, J. C. FRASER, D. J. HUGO.

Papers: President—A. R. SIBSON; Vice President—J. C. FRASER, C. KINSMAN.

Safety Precautions Committee: J. C. DOWNEY (Convenor), G. J. MULLER, C. KINSMAN, J. C. FRASER, C. G. DOWNIE, A. R. SIBSON.

**DIE AGENDA**

1. Verkiesing van die President.
2. Vergaderplek van die volgende Konferensie.
3. Verkiesing van Onder-president, lede van die Uitvoerende Raad, subkomitees en verteenwoordigers.
4. Die jaarverslag van die Sekretaris en die Tesourier.
5. Die Afskeidsrede van die aftredende President.
6. Die Presidentsrede.
7. Die verslag van subkomitees en verteenwoordigers.
  - (i) „World Power Conference“.
  - (ii) Die Registrasieraad vir Elektriese Bedradingmanne.
  - (iii) Die Registrasie van elektriese Bedradingskontrakte.
  - (iv) Die Suid-Afrikaanse Buro vir Standaard.
  - (v) Metertoetskode.
  - (vi) Die Komitee vir Veiligheidsmaatreëls.
  - (vii) Gebruikskode vir bogronde lynne.
  - (viii) Steenkoolvoorrade.
  - (ix) Wysiging van die Konstitusie.
8. Aanstelling van ouditeure.

**AFTREDENDE AMPSEKLEERS**

President: A. R. SIBSON, Bulawayo.

Onder-President: J. C. FRASER, Johannesburg.

Oud-Presidente: J. C. DOWNEY, Springs.  
C. R. HALLE, Pietermaritzburg.

Stadsraadslede: Bloemfontein, Bulawayo, Kaapstad, Durban, Johannesburg, Krugersdorp, Port Elizabeth en Salisbury.

Opmerking.—Die dorp of stad word tot lid gekies, en nie individuele raadslede nie.

Ander Lede: D. A. BRADLEY, Port Elizabeth; C. G. DOWNIE, Kaapstad; C. KINSMAN, Durban; J. E. MITCHELL, Salisbury; G. J. MULLER, Bloemfontein; L. J. VAN DER WALT, Krugersdorp.

**LEDE VAN DIE SUBKOMITEES EN VERTEENWODIGERS**

Steenkoolvoorrade: C. G. DOWNIE (same-roeper), D. A. BRADLEY, J. C. FRASER, D. J. HUGO.

Referate: President—A. R. SIBSON; Onder-president—J. C. FRASER, C. KINSMAN.

Die Komitee vir veiligheidsmaatreëls: J. C. DOWNEY (same-roeper), G. J. MULLER, C. KINSMAN, J. C. FRASER, C. G. DOWNIE, A. R. SIBSON.

Registration of Electrical Wiring Contractors: C. G. DOWNIE (Convener), D. A. BRADLEY and A. FODEN.

#### Representatives:—

S.A. Bureau of Standards—Safety Codes and other Committees: J. L. VAN DER WALT, Alternate J. C. DOWNEY.

Safety Precautions: J. C. DOWNEY, Alternate J. C. FRASER.

Coal Allocation Committee: C. G. DOWNIE, Alternate D. J. HUGO.

World Power Conference Local Committee: J. C. FRASER.

Electrical Wireman's Registration Board: J. C. FRASER.

Die registrasie van elektriese bedradingskontraktante: C. G. DOWNIE (sameroeper), D. A. BRADLEY and A. FODEN.

#### Verteenwoordigers:—

Die S.A. Buro vir Standaarde—Die Komitee vir Veiligheidskodes en ander komitees: J. L. VANDER WALT, plaasvanger J. C. DOWNEY.

Veiligheidsmaatreels: J. C. DOWNEY, plaasvanger J. C. FRASER.

Komitee in sake die toewysing van steenkool: C. G. DOWNIE, plaasvanger D. J. HUGO.

„World Power Conference“ (plaaslike komitee): J. C. FRASER.

Registrasieraad vir elektriese bedradingsmanne: J. C. FRASER.

### PROGRAMME

#### Monday, 20th April, 1953

9.00 a.m. Meeting of the Executive Council in Board Room, Electricity Department Office, President Street West.

#### Tuesday, 21st April, 1953

9.00 a.m. Registration, Issue of Papers, etc.

10.00 a.m. Official opening of convention by the Hon. the Administrator of the Transvaal, Dr. W. Nicol.

Election of President.

Venue of next convention.

10.30 a.m. Refreshment Interval.

11.00 a.m. Address by Dr. J. T. Hattingh, Chairman Electricity Supply Commission.

Address by Mr. James R. Beard, C.B.E. Vice President—British Electrical Power Convention.

Election of Vice President and Office Bearers.

12.30 p.m. Civic Luncheon.

2.30 p.m. Convention resumes.

Annual report of Secretary and Treasurer. Retiring President's Valedictory Address.

4.00 p.m. Official Photograph. (Library Steps.)

8.00 p.m. Theatre (Guests of City Council).

#### Wednesday, 22nd April, 1953

8.30 a.m. Meeting of Executive Council in Selborne Hall.

9.30 a.m. Convention resumes.

Communications from Council.

Presidential Address.

Reports of Sub-Committees and Representatives.

10.30 a.m. Refreshment Interval.

Appointment of Auditors.

Paper: Discussion on the "Basic Principles of the Construction of Electricity Tariffs" by G. Pulik, Dipl. Eng., A.M.I.E.E., A.M.(S.A.)I.E.E. (Johannesburg Electricity Department).

### PROGRAM

#### Maandag, 20 April 1953

9.00 vm. Vergadering van die Uitvoerende Raad in die Raadkamer, Elektriesiteitsafdeling, Presidentstraat-Wes.

#### Dinsdag, 21 April 1953

9.00 vm. Registrasie, uitreiking van referate, ens.

10.00 vm. Amptelike opening van die konferensie deur Sy Edele die Administrateur van die Transvaal, dr. W. Nicol. Verkiezing van President. Vergaderplek van die volgende konferensie.

10.30 vm. Pouse. Verversings.

11.00 vm. Rede deur dr. J. T. Hattingh, Voor-sitter—Die Elektriesiteitsvoorsienings-kommissie.

Rede deur mnr. James R. Beard, Onder-president, British Electrical Power Convention.

Verkiezing van Onder-president en amps-bekleers.

12.30 nm. Amptelike noenmaal.

2.30 nm. Die konferensieverrigtinge word hervat. Die jaarverslag van die Sekretaris en Tesourier.

Die aftredende President se afskeidsrede.

4.00 nm. Amptelike foto word geneem op die Biblioteek se trapies.

8.00 nm. Skouburgpartytjie (as gaste van die Stadsraad).

#### Woensdag, 22 April 1953

8.30 vm. Vergadering van die Uitvoerende Raad in die Selbornesaal.

9.30 vm. Die konferensieverrigtinge word hervat. Mededelings van die Uitvoerende Raad. Die Presidentsrede.

Die verslag van Subkomitees en Verteenwoordigers.

10.30 vm. Pouse, verversings. Aanstelling van ouditeure.

Referaat: Bespreking van die onderwerp „Basic Principles of the construction of Electricity Tariffs“ deur G. Pulik, Dipl. Eng., A.M.I.E.E., A.M.(S.A.)I.E.E., (Die Johannesburgse Elektriesiteitsafdeling).

- 12.30 p.m. Luncheon Adjournment.  
 2.30 p.m. Visit to Orlando Power Station (Transport from City Hall).  
 5.30 p.m. Cocktail Party and Braai/leis at Orlando Power Station.

#### Thursday, 23rd April, 1953

- 8.30 a.m. Meeting of Executive Council in Selborne Hall.  
 9.30 a.m. Convention Resumes. Communications from Council. Paper: "Centralised Injection Control of Water Heaters and Street Lighting in Salisbury, Southern Rhodesia", J. E. Mitchell, B.Sc.(Tech.)Hons., M.I.E.E., M.I.Mech.E.  
 10.30 a.m. Refreshment Interval.  
 11.00 a.m. Discussion on papers and other business.  
 12.30 p.m. Luncheon adjournment.  
 2.30 p.m. Convention resumes. "Engineers Forum". Questions and Answers on subjects of practical interest.

#### Friday, 24th April, 1953

- 8.30 a.m. Meeting of Executive Council in Selborne Hall.  
 9.30 a.m. Convention resumes. Communications from Council. Discussion on papers and any other business.  
 10.30 a.m. Refreshment Interval.  
 11.00 a.m. Convention resumes.  
 12.30 p.m. Convention closes if business completed.  
 2.30 p.m. Meeting of Executive Council.

#### LADIES' PROGRAMME

##### Tuesday, 21st April, 1953

- 10.00 a.m. Official Opening of Convention.  
 10.30 a.m. Refreshment Interval.  
 11.00 a.m. Annual General Meeting.  
 12.30 p.m. Civic Luncheon.  
 4.00 p.m. Official Photograph (Library Steps).  
 8.00 p.m. Theatre (Guests of City Council).

##### Wednesday, 22nd April, 1953

- 10.00 a.m. Tea at John Orr's Showrooms followed by Mannequin Parade.  
 2.30 p.m. Orlando Power Station. Guests of Orlando Ladies Bowling Club. (Transport from City Hall).  
 5.30 p.m. Cocktail Party and Braai/leis at Orlando Power Station.

##### Thursday, 23rd April, 1953

- 2.30 p.m. Tour of City and Suburbs (Transport from City Hall).  
 Tea at Zoo Lake Kiosk.

- 12.30 nm. Vergadering vir middagete.  
 2.30 nm. Besoek aan die Orlandose kragentrale (voertuie vertrek van die stadhuis af.)  
 5.30 nm. Skemerpartytjie en braai/leis by die Orlandose Kragentrale.

#### Donderdag, 23 April 1953

- 8.30 vm. Vergadering van die Uitvoerende Raad in die Selbornesaal.  
 9.30 vm. Die konferensieverrigtinge word hervat. Mededelings van die Uitvoerende Raad. Referaat: „Centralised Injection Ripple Control of Water Heaters and Street Lighting in Salisbury, Southern Rhodesia”, J. E. Mitchell, B.Sc.(Tech.) Hons., M.I.E.E., M.I.Mech.E.  
 10.30 vm. Pouse. Verversings.  
 11.00 vm. Bespreking van referate, en ander sake.  
 12.30 nm. Vergadering vir middagete.  
 2.30 nm. Die konferensieverrigtinge word hervat. „Die Ingenieursforum”. Vrae en antwoorde oor onderwerpe van praktiese belang.

#### Vrydag, 24 April 1953

- 8.30 vm. Vergadering van die Uitvoerende Raad.  
 9.30 vm. Die konferensieverrigtinge word hervat. Mededelings van die Uitvoerende Raad. Bespreking van referate, en ander sake.  
 10.30 vm. Pouse. Verversings.  
 11.00 vm. Die konferensieverrigtinge word hervat.  
 12.30 nm. Die konferensieverrigtinge word afgesluit indien alle sake afgehandel is.  
 2.30 nm. Vergadering van die Uitvoerende Raad.

#### PROGRAM VIR DIE DAMES

##### Dinsdag, 21 April 1953

- 10.00 vm. Die amptelike opening van die Konferensie.  
 10.30 vm. Pouse. Verversings.  
 11.00 vm. Die algemene jaarvergadering.  
 12.30 nm. Die amptelike noemaal.  
 4.00 nm. 'n Amptelike foto word geneem (op die Biblioteek se trappies).  
 8.00 nm. Skouburgpartytjie (as gaste van die Stadsraad).

##### Woensdag, 22 April 1953

- 10.00 vm. Teepartytjie in John Orr se vertoonlokaal, gevolg deur 'n modeparade.  
 2.30 nm. Die Orlandose Kragentrale, as gaste van die Orlandose Damesrolbalklub. (Voertuie vertrek van die stadhuis af).  
 5.30 nm. Skemerpartytjie en braai/leis by die Orlandose Kragentrale.

#### Donderdag, 23 April 1953

- 2.30 nm. 'n Rondreis deur die stad en die voorstede (Voertuie vertrek van die stadhuis af).  
 Teepartytjie by die Dieretuinmeer-kiosk.

## THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

### Proceedings of the Twenty-Seventh Convention, 1953

The Twenty-Seventh Convention of the Association was opened in the Selborne Hall, Johannesburg, by the Honourable the Administrator of the Transvaal, Dr. W. Nicol, at 10.00 a.m. on Tuesday, 21st April, 1953.

Representatives of 75 Councils attended the Convention, including 46 Councillor Members, 78 Engineer Members, 3 Honorary Members, 9 Associates, 19 Delegates or Representatives of Government Departments, other Supply Authorities, etc., 68 Trade Representatives, 19 other visitors and 124 Ladies—a total of 366. Apart from those detailed above, a number of visitors did not register.

#### CIVIC WELCOME

PRESIDENT (Mr. A. R. Sibson, Bulawayo):

Ladies and Gentlemen: It is with very great pleasure that I welcome here this morning His Worship the Mayor of Johannesburg, who will introduce to you His Honour the Administrator of the Transvaal, who will open the proceedings today. I am sure we are very grateful indeed to His Worship the Mayor for any arrangements that he has made for our accommodation and entertainment while here in Johannesburg; and we do thank him for what he has done, and I have no doubt will be doing in the course of the next few days.

It is not my function, at this stage, to do more than welcome His Worship the Mayor and ask him if he will be good enough to introduce you to His Honour the Administrator of the Transvaal, Dr. W. Nicol.

HIS WORSHIP THE MAYOR OF JOHANNESBURG (Councillor H. Miller):

Mr. President, the Honourable the Administrator and Mrs. Nicol, Ladies and Gentlemen: Johannesburg is in the happy position of being able to extend a most hearty welcome to the Delegates attending the Annual Convention of the Association of Municipal Electricity Undertakings of Southern Africa as a group of old friends,

because this, the Twenty-Seventh Annual Convention, is the fifth occasion on which you have assembled here in Johannesburg.

When you gathered here last, in 1944, South Africa, in common with the United Nations, was engaged in a life and death struggle for freedom so that problems for the development of electricity undertakings had of necessity to take second place to the South African war effort.

To-day, you are meeting under happier conditions and at a time when your undertakings have made considerable progress in this country in the post-war years.

I trust that you will not only have a successful Conference but also enjoy the extensive hospitality which our city will offer you during the course of your deliberations.

Die huidige konferensie is te meer merkwaardig van weë die feit dat ons vanmôre Sy Edele die Administrateur van die Transvaal, Dr. Willem Nicol, en mev. Nicol in ons midde het, en ek wil hulle graag baie hartlik welkom heet. Dr. Nicol het goedgeestiglik ingewillig om die konferensie toe te spreek en die verrigtinge formeel te open. Dit is die eerste keer dat die eer hierdie Vereniging te beurt val om die Administrateur hier te hê, en ek is oortuig daarvan dat die Vereniging hierdie eer verdien, veral omdat Sy Edele die Administrateur so nou betrokke is by die ontwikkeling van die elektrisiteitsondernemings van alle plaaslike besture in hierdie Provinsie. Johannesburg wil graag Sy Edele die Administrateur bedank vir sy bydrae vir die merkwaardige uitbreiding van ons eie elektrisiteitsonderneming, en ek kan hom verseker dat hy as gevolg van hierdie belangstelling inderdaad 'n wesenlike bydrae tot die welsyn van die inwoners van hierdie stad, en van die Provinsie as geheel, gelewer het.

Ladies and Gentlemen, many of you who do not perhaps know the Administrator of the Transvaal personally, can rest assured of one very interesting fact, and that is that his versatility in his work as Administrator



J. C. FRASER, Johannesburg  
President, 1953-1954



of the Transvaal is so remarkable that he has not only the keen interest of the people of the Transvaal at heart but he has his finger on the pulse of the development of all that takes place in this Province.

As I have said, the great development and expansion of Johannesburg's own undertakings would hardly have been possible without the co-operation, the sympathy and the interest of His Honour the Administrator: and I cannot think of anyone better suited to have opened this important Convention this morning than His Honour the Administrator. I am sure that we will listen to him with very great interest, and that he will make a very fruitful contribution to this Convention here to-day.

I now have great pleasure in calling upon His Honour the Administrator to address you and to open the proceedings.

#### HIS HONOUR THE ADMINISTRATOR OF THE TRANSSVAAL (Dr. W. Nicol):

Meneer die Voorsitter, Dames en Here:

Ek wil u van harte bedank vir die uitnodiging om teenwoordig te wees by die opening van u 27ste Kongres en om hier 'n paar woorde te spreek.

Telkens as ek na Johannesburg kom om 'n Kongres na Transvaal te verwelkom, keer ek terug na my woning met die versekering dat die afgevaardigdes tenminste 'n aangename tyd hier sal deurbring. Daarvoor kan ek altoos op Johannesburg reken. As die amptenare van die Johannesburgse Stadsraad met die onthaal te doen het, kan ek met nog groter versekerheid gerus wees dat hulle die eer van die Goudstad en terloops van ons Provinsie sal hoog hou. Ek vertrou dat u die verblyf sal geniet en dat u op die bepaalde tyd uitmekaar sal gaan met die oortuiging dat u aan ons net soveel kennis meegedeel het as wat u van ons opgedoen het.

Meneer die Voorsitter, ek verneem dat u Kongres iets te doen het met elektrisiteit. Van daardie onderwerp wil ek nie voorgee iets te weet nie.

Nou ja, ek erken dat ek raakgesien het dat sommige skakels horisontaal werk, van links na regs, terwyl ander vertikaal aangeslaan word, van bo na benede. Ek het egter nog nie kon vasstel of 'n ketel gouer met die een stelsel as met die ander kook nie!

Nevertheless there was a sufficient reason why I accepted your invitation to press the button for the launching of this convention.

In this Province the local authorities function under the general control and under the very particular audit of the Provincial Administration. The result is that I am from time to time faced with proposals for the erection or extension of power stations and distribution systems. One would like to create opportunities for every local authority to supply all the current required by its potential customers, but on the other hand it remains the duty of the Administrator to protect the interests of the next generation of tax-payers. This responsibility, which the Administrator bears with regard to municipal electrical undertakings, gives me a right to be present here. I shall be glad to be informed of the results of your deliberations insofar as they may be the concern of the Provincial Administration.

The man-in-the-street undoubtedly still thinks of the supply of electricity as intended primarily for the lighting of our houses and streets. According to the Biblical narrative the first act of creation was the majestic summons: "Let there be light!" Haydn in his great oratorio *The Creation*, moves quietly up to this point, but as the overwhelming glory of light bursts upon the face of primordial chaos he prescribes a resounding crescendo for choir and organ, while brass, strings and wind re-echo from the orchestra to greet with joy this glorious phenomenon—Light!

It is indeed a pity that we get accustomed to these miracles. If we duly appreciated the wonder of the new light bursting over the earth with unflinching regularity every morning, if we realised the part light plays in our happiness, our civilisation and our very animal existence, we would be up and out every morning to see the dawn break and the sun rise. No wonder that there are those who worship the sun as the source of light, warmth and life.

Something of a similar nature happened when first man saw the filament glow in a bulb and send out light. It was on a much smaller scale than the daily performance of nature, but it was in one sense even more surprising: it was controlled by man.

The entry of electric light into our civilisation marks the beginning of a new

chapter in the history of culture. When visiting farms of the less privileged on the platteland, I have often wondered that they still find pleasure in reading by the inferior light at their disposal. When I was a member of the National Advisory Council for Adult Education I seriously requested them to consider a proposal that the Government should subsidise the purchase of good lamps by all persons living beyond the reach of electric current. It would be money well spent. The provision of good light is a primary requirement if our people are to spend their evenings in profitable occupation.

Of course, I know you will tell me that your profession would suffer a blow-out if you were to live on current supplied for lighting purposes. You depend primarily on the current you can supply for power and heating as it is drawn off for industrial and other purposes. There is in fact a remarkable difference to be noted between the English Industrial Revolution of more than a century ago, and our own peaceful Industrial Revolution, now gradually getting into its stride.

In both cases, there was an unprecedented demand for power, but in the first that power had to be supplied by men and animals, gradually supplemented by steam, while in our case it is electric power that we depend on primarily. We have had our own experience of this change-over in South Africa; I refer you, for instance, to the Gold Mining Industry which started on manpower and steam, and today survives on electricity. When I came to the Rand forty years ago, many of the old mines still held their row of steam boilers in reserve in case electricity should leave them in the lurch. I suppose all these boilers have since found their way to small municipalities and the like!

Another and even more striking example of this change-over from steam to electricity is supplied by Witbank. I remember that when Escom started their power station at Witbank it was argued that they would be able to supply current to the coal mines, at that time all dependent on steam generated locally. The late Dr. Hendrik van der Bijl, usually a cautious optimist, stated publicly that he attached no value to that expectation as all the mines had already installed and written off their steam plant and were using their own coal

to generate power almost free of cost. Yet what are the facts? Today practically all the steam plants have closed down, the mines supply coal to Escom at less than 5s. a ton and buy clean current from Escom for all their requirements. This must rank as one of the greatest victories of electricity over steam.

However that may be, it is indeed a surprising dispensation that our great deposits of gold ore should be flanked on the South by South Africa's major water supply and on the North-East by our illimitable supply of coal. We accordingly had the free choice of steam or electricity. Perhaps my reference to this concentration of riches will remind you of the old lady who marvelled at the wisdom which had arranged her physiognomy in such a way that when she placed her spectacles before her eyes, the loop rested exactly on the bridge of her nose, while the stems fitted snugly behind her ears!

In any case electricity has won the day and our mines operate on electricity today. They have set the example and wherever the load justified the investment the railways have followed suit. In fact, every major industry has learnt that your commodity yields the best source of power for their requirements. The all-electric home is fast coming to South Africa and promises to compensate in large measure for the increasing difficulties of our servant problem.

The last industry likely to be satisfactorily served by electricity in South Africa is farming, our largest, most important and really basic industry. I can easily understand your difficulties: the comparatively great distances between farms in South Africa, the prohibitive cost of equipment, the shortage of power available for distribution at the existing power stations and the inability of the farming community to meet the cost.

Nevertheless the sociological implications of electricity on the farms make it imperative that this provision should be seriously considered. It is a matter of national importance. Consider the fact that we are failing all along the line to keep our young people on the farms. In many districts it is now quite exceptional for the son of the average farmer to return to the farm and take up his father's task. The young girls almost all flee to the towns



LIST OF PERSONS IN GROUP PHOTOGRAPH—JOHANNESBURG CONVENTION—MAY, 1953

- Left to right:**
- Front Row:** J. L. van der Walt (Krugersdorp), Cr. A. Markman (Port Elizabeth), J. E. Mitchell (Salisbury), Cr. A. Maroon Jeffrey (Salisbury), Cr. M. C. Dames (Krugersdorp), A. R. Silson (Bulwerston), Mrs. J. C. Fraser (Johannesburg), Cr. H. Miller (Johannesburg, Mayor), J. C. Fraser (President, Johannesburg), Mrs. H. Miller (Johannesburg, Mayor), G. J. Muller (Bloemfontein), J. C. Dooey (Springs), D. A. Bradley (Port Elizabeth), Cr. Kinsman (Durban), Cr. W. H. Harrison (Johannesburg), J. R. Beard (London), A. T. Taylor (Gqeberha).
- Second Row:** R. W. Kruis (Johannesburg), J. M. Magnuson (Salisbury), Cr. R. C. Maclean (Somerset West), Mrs. R. C. Maclean (Somerset West), Sr. E. H. Jones (Mafeking), P. H. Newcombe (George), Mrs. R. V. Bailey (Edenvalle), J. B. Cherry (Randfontein), Mrs. J. R. Cherry (Randfontein), Miss J. E. Irwin (Kimberley), Mrs. S. E. Irwin (Kimberley), Mrs. D. A. Bradley (Port Elizabeth), Mrs. N. R. Yorke (Johannesburg), F. Stevens (Randfontein), Cr. C. E. K. Young (Pietermaritzburg), Cr. H. L. Richardson (Durban), Cr. K. Hall (Pietermaritzburg).
- Third Row:** H. A. McLaren (Vereniging), W. G. Theron (Worcester), Cr. C. C. A. de Villiers (Worcester), Cr. D. O. Louw (Standerfont), R. V. Baker (Edenvalle), Miss M. Cherry (Randfontein), J. S. Craig (Greyton), Mrs. F. Stevens (Ladysmith), Mrs. I. J. Dooey (Springs), Mrs. R. H. W. Taizton (Springs), Cr. R. H.W. Taizton (Springs), Cr. M. J. Moolman (Etosuat), Cr. G. G. Downie (Cape Town).
- Fourth Row:** W. N. Stevens-Burt (Johannesburg), Mrs. M. J. Moolman (Etosuat), Mrs. W. H. Walsh (Durban), Mrs. C. Kinsman (Durban), Mrs. S. de V. de Villiers (Robertson), Mrs. D. R. Verhoever (Vredes), Mrs. R. W. Kane (Johannesburg), Mrs. L. G. Aze (Johannesburg), Mrs. A. T. Taylor (Johannesburg), R. T. Park (Port Elizabeth), Geo. Wilbers (Johannesburg), W. H. Antrick (Somerset East), Mrs. W. H. Antrick (Somerset East), E. de C. Pretorius (Stellenbosch), G. B. Isaacs (Standerfont), J. A. Maclean (De Aar), E. W. Dixon (Germiston), W. J. Gibbons (Johannesburg); J. G. F. Erykson (Etosuat), T. Emmerson (Johannesburg).
- Fifth Row:** J. F. Lategan (Helderskop), F. H. Tyler (Germiston), R. Leichman, W. H. Milton (Johannesburg), Mrs. C. Lombard (Germiston), Mrs. F. L. Vergantini (Brakpan), W. Rash (Verbeide), I. C. Calle (Johannesburg), Cr. S. W. Sandzilak (Salisbury), G. A. Dalton (Johannesburg), J. E. T. Gode (Pretoria), L. G. Aze (Johannesburg), K. M. Johnston (Johannesburg), H. A. Eastman (Somerset West), Cr. J. P. W. Chapman (New London), Cr. R. Burton (Kimberley), Cr. L. James (Kimberley), S. T. Williams (Pretoria), H. T. Turner (Lynn), D. J. Hugo (Pretoria).
- Sixth Row:** F. L. Vergantini (Brakpan), Mrs. H. M. S. Muller (Ugthington), H. M. S. Muller (Ugthington), Mrs. C. H. Adams (Oudshoorn), C. H. Adams (Oudshoorn), R. W. Barton (Wilkom), E. L. Smith (Brakpan), ———, R. G. Edwards (Johannesburg), J. W. Swaid (Pretoria), J. A. Barnett (Johannesburg), ———, T. J. Millen (Nigel), L. Funcher (Kompton Park), H. Sechroski (Salisbury), Mrs. J. Wilson (Pretoria), Mrs. D. J. Hugo (Pretoria), Miss G. L. de Bort (Johannesburg), D. J. Hugo (Pretoria).
- Seventh Row:** ———, C. Lombard (Germiston), S. E. Irwin (Kimberley), ———, R. N. F. Smit (Pretoria), A. Foden (East London), F. J. Vorster (Fongersfontein), J. C. Strauss (Ugthington), D. Lees (Bosoni), F. Beckler (Hartemob), J. J. Inglis (Pietermaritzburg), J. L. McNeil (Stanger), ———, Cr. S. E. Jansen (Port Shepstone), S. de V. de Villiers (Robertson), Cr. R. C. du Plooy (Wolvenara), Cr. S. L. Muller (Robertson), K. W. J. Halliday (Port Shepstone), S. G. Redman (Johannesburg), J. Wilson (Pretoria), Cr. C. E. Acton (Pretoria), Mrs. J. O. Rappin (Ladysmith), Cr. F. van den Hoogen (Pretoria), A. H. Johnson (Graaff-Reinet), D. R. Verschoor (Vredes).
- Eighth Row:** ———, Mrs. J. C. Ansellberg (Emmeloo), F. C. Ansellberg (Emmeloo), M. N. Kuyberg (Beutal), F. V. Perrow (Johannesburg), ———, ———, G. N. Sims (The Strand), Cr. W. H. Mitchell (Pietermaritzburg), Mrs. A. C. Grant (Johannesburg), Mrs. W. M. Odendaal (Robertson), W. Rosler (Kroonstad), A. Rosler (Kroonstad), V. E. O. Berrant (Queenstown), Cr. J. S. Pierce (Graaff-Reinet), N. G. Hoeking (Johannesburg), ———, F. Q. McDonald (Pietermaritzburg), J. A. Matthews (Lizenzburg), ———, W. N. Powell (Johannesburg), J. Coetzee (Johannesburg), B. Marchand (Wilhelms), A. L. Sandes (Johannesburg), R. W. Hayman (Johannesburg), ———, W. E. L. Tricketts (Johannesburg), Cr. E. W. Tardell (Queenstown), ———, H. M. Rochester (Johannesburg), A. C. Grant (Johannesburg), J. M. Gietzke (Klerksdorp), J. van der Spuy (Onderstepoort), W. G. Thackway (Kokstad), J. Jorack (Grahamstown), P. A. Mieritzius (Rustenburg), J. C. van der Walt (Theunissen).

and cities. It is easy to condemn this practice, but a more careful study of what really happens to two sisters, one of whom stays on the farm while the other undertakes work in town, proves that there is much to be said on either side. Unless young people can inherit a running concern on the farm it requires a lot of pluck and perseverance to remain there.

Consider the prospects of participating in the cultural life of the nation as offered by the town in comparison with the cultural backwardness of farms in many areas, and again we must sympathise with the young person who refuses to be relegated to darkness and despondency. In addition there has arisen in the last decade the very great handicap of shortage of labour on the farms. Until recently this was not the case and it was commonly stated that the farmer's wife had a servant for every finger of her right hand. That is, however, a thing of the past. Today both the farmer and his wife have to deal very politely with their servants if they are to retain them at all.

From every point of view, whether it concerns the cultural or the economic aspects of the farmer's life, we must look forward to the day when we shall have electricity on the farm.

There are a few limited areas where good progress has already been made with the supply of electric current to farms. I am thinking of a small portion of the Western Province and similarly of Natal.

It must be expected that such country schemes will initially require to be subsidised. Bearing in mind the interdependence of the farmer and the town-dweller the scheme should be seen as part of a whole—at least in all cases where a reasonable expectation exists that the country section of the scheme will in due time become self-supporting.

In this connection much could be done to educate the platteland to the full use of electricity. It happens too often that the supply is installed but not fully used. The farmer's wife has pressed for electric light, she gets her way and considers she is doing very well when she connects up a few household appliances, but the farmer all too frequently keeps his expensive power units running on expensive imported fuel. I am not so sure that enough is being done to persuade those who have an electric connection to use their asset to the full.

All this must be very unrealistic to many of you for the simple reason that your power stations are at present unable to meet all the needs of your own municipal area, let alone the larger area allocated to you for supply. But the time will come, I hope soon, that we will be able to meet the needs of a wider area; our action should then be based on a far-seeing policy.

So, Mr. Chairman and Gentlemen, it seems to me that the needs of South Africa call for all the wisdom, ingenuity and enterprise that you and your councils can command to supply more current, over larger areas at lower rates. Our cheap coal as well as the need of our people, especially on the platteland, constitutes a challenge to your profession to evolve schemes for meeting that need.

Mr. Chairman, I do not think I should go any further. I have tried to praise your profession by pointing to the miracle you achieve in providing us with light and power; I have also tried to leave a challenge with you to bring your commodity to our people more generally. I leave it at that lest I get beyond my depth.

My sincere wish is that your convention may be eminently successful.

HIS WORSHIP THE MAYOR OF JOHANNESBURG (Councillor H. Miller):

Mnr. die President, Dames en Here: Ek wil Sy Edele die Administrateur hartlik bedank vir sy baie interessante toespraak en ons waardering uitspreek vir die belang wat hy in hierdie Konferensie gestel het om hier vandag teenwoordig te wees.

Ladies and Gentlemen, I am sure that all of us have enjoyed the very interesting address of His Honour the Administrator, and I cannot too highly express our appreciation for his presence here and his support of the work which the Electricity Undertakings will deliberate upon during this Convention. I trust that the few moments he will spend with us will be of great interest to him. I am sure, Your Honour, that every Delegate has been most appreciative not only of your presence here but of your address.

PRESIDENT (Mr. A. R. Sibson, Bulawayo): Your Honour the Administrator, Mrs. Nicol, His Worship the Mayor, Mrs. Miller, Ladies and Gentlemen: I am sure you will agree with me that we are extremely

fortunate at this Convention in Johannesburg in having not only His Honour the Administrator to give us so inspiring and interesting an address, but also to have His Worship the Mayor of Johannesburg to introduce His Honour and to welcome us here to his great city.

Now, I do want to convey to His Worship the Mayor and to his Council the very deep thanks to him that all of us feel, for inviting the Convention to take place in Johannesburg, and also for the very fine programme that has been prepared and which appears on your Agenda. It is now I think, nine years since we last met in the Golden City, and we are looking forward with great anticipation to the few days that we shall spend here. For my part, I am particularly delighted that His Worship has such a very good pull with the Meteorological Department: we have certainly started off well so far as the weather is concerned; and, if the rest of the performance lives up to that expectation, I have no doubt whatever that we shall have a very happy time indeed while we are here in Johannesburg.

So, Your Worship, I do tender to you, on behalf of all Delegates and Visitors and those present at this Convention, our heartiest thanks for your hospitality and for the very kind way in which you have come this morning to carry out the very important duty that you have performed in so gracious a manner. Thank you.

#### ELECTION OF PRESIDENT

Ladies and Gentlemen, it is now necessary to elect your new President; that is our first duty, according to our Agenda, and I have pleasure in calling for nominations for the position of President for the ensuing year.

Mr. C. KINSMAN (Durban): Your Honour, Your Worship, Mr. President, Ladies and Gentlemen: It is my privilege to propose as President of this Association for the ensuing year a man who has served this great city and our Association with great benefit to them and credit to himself; a man ripe in experience, tenacious in debate, sage in leadership; a man who, for an Engineer, bears also a very distinguished appearance—and that's unusual amongst Engineers—(Laughter). I have pleasure in proposing, as President of this Association for the ensuing

year, Mr. J. C. Fraser, General Manager of the Electricity Undertaking of this city.

Councillor C. E. K. YOUNG (Pietermaritzburg): Mr. President, I have much pleasure in seconding the nomination and, in doing so, I feel that we are going to have a most successful year under the Presidency of Mr. J. C. Fraser; during the past five years I have had the pleasure of listening to him propounding problems and tendering advice in particular to the younger Engineers and he has at all times been most willing to answer questions and tender sound advice.

PRESIDENT (Mr. A. R. Sibson, Bulawayo): Are there any other nominations, Ladies and Gentlemen? If there are no other nominations, I have very great pleasure indeed in declaring Mr. J. C. Fraser, General Manager of the Electricity Undertaking of Johannesburg, as your President for the ensuing year. Mr. Mayor, may I call upon you to do us the honour of investing Mr. Fraser with the Chain of Office?

(On receiving the Chain of Office, Mr. Fraser assumed the Chair in place of Mr. Sibson).

PRESIDENT (Mr. J. C. Fraser): The Honourable the Administrator, His Worship the Mayor, Ladies and Gentlemen: I very greatly appreciate the honour you have conferred upon me in electing me President of the Association for the ensuing year. Whilst doing so, I fully appreciate the responsibilities attached to the office and trust that your confidence will not be misplaced.

As you will be hearing from me a little later in the proceedings, I will content myself, at this stage, by thanking the proposer—Mr. Kinsman, and the seconder—Councillor Young for the kind and flattering remarks they have made concerning myself: and will leave it at that, for the moment, Ladies and Gentlemen. Thank you very much indeed.

#### APOLOGIES AND GREETINGS, ETC.

Apologies for non-attendance and greetings were received from:—

Councils:

Aliwal North, Barberton, Brandfort, Butterworth, Matatiele, Middelburg, C.P., Newcastle, Paarl, Port Alfred, Que Que, Springfontein, Ventersdorp, Vryburg, Winburg.

**Other Members:**

Dr. J. H. Dobson and Mr. E. Poole, Honorary Members. Messrs. H. J. Gripper, T. M. Mocke, R. H. Redman and W. E. L. Woolridge, Engineer Members. W. Bellad-Ellis, Associate.

**Government Departments and Other Institutions, etc.:**

Mr. E. L. Damant, Manager, Natal Undertaking, Electricity Supply Commission.

Chairman, Industrial Development Corporation of South Africa Ltd.

Mr. T. S. Trelease, Joint Manager, Rand Undertaking, Electricity Supply Commission.

Mr. F. E. Kanthack, Kanthack & Partners, Consulting Engineers.

Mr. E. W. Swann, President, South African Institution of Civil Engineers.

**PRESIDENT:** I am sorry to announce that Mr. Tarran, Electrical Engineer, Benoni, is seriously ill; I am sure you would like me, on behalf of the Convention, to send him a letter of sympathy and the hope that he will soon be restored to health.

Are there any other communications? If not, I would like to know if there is any invitation for the venue of our next Convention?

**VENUE OF NEXT CONVENTION**

Raadslid G. A. FICHARDT (Bloemfontein): Mnr. die Voorsitter: Dit is vir my 'n aangename voorreg om namens my Stadsraad die Vereniging baie hartlik uit te nooi om die Konvensie aanstaande jaar in Mei-maad in Bloemfontein te hou.

Mr. President, if the next Convention is held at Bloemfontein, I can assure you that you will receive a very warm welcome in true Free State fashion.

President: Thank you very much. If there are no other invitations I have very much pleasure, on behalf of the Association, in accepting the invitation for our next Convention to be held at Bloemfontein.

**ELECTION OF VICE-PRESIDENT**

I now ask for nominations for the position of Vice-President for the ensuing year.

Mr. A. R. SIBSON (Bulawayo): Mr. President, it gives me very great pleasure to nominate Mr. Muller, of Bloemfontein, as Vice-President for the ensuing year. Mr.

Muller is one we have known very well over the years that we have been associated, and it would give us all, I am sure, the very greatest pleasure to see him in the position of Vice-President during the year that lies ahead. I have very great pleasure in proposing him.

Mr. J. L. VAN DER WALT (Krugersdorp): I have much pleasure in seconding. (There were no further nominations.)

**PRESIDENT:** Mr. Muller, I am very happy to announce that you have been elected Vice-President, and I now ask you to take your seat at the rostrum.

Mr. G. J. MULLER (Bloemfontein): Mr. President and Gentlemen: I would like to convey to the Convention my very sincere thanks for the trust placed in me once again; and I hope that, when you visit us next year in Bloemfontein, you will take away with you what I fondly believe were the happy memories you had of the last Convention held there; and, as my Councillor said, "ons sal julle op eg Vrystaatse manier daar traktee, en ons hoop u sal dit besonder geniet".

**PRESIDENT:** Now, Ladies and Gentlemen, it is time for refreshments. We shall adjourn the Convention for half-an-hour.

(Convention adjourned for tea at 10.40 a.m. and resumed its sitting at 11.20 a.m.)

**ADDRESS BY DR. J. T. HATTINGH, Chairman—Electricity Supply Commission**

**PRESIDENT:** Ladies and Gentlemen: It gives me great pleasure to introduce to you Dr. Johannes Theobald Hattingh, Chairman—Electricity Supply Commission.

Dr. Hattingh is, no doubt, known to a good many of our members who are present today.

Dr. Hattingh was born in South Africa and after he qualified went to the United States of America returning to the Union in 1919. He has been associated with the Electricity Supply Commission since 1923 and has played a prominent part in Escom's major undertakings since that date.

Dr. Hattingh has written several books to mention two only—*A Universal Sag Chart* and *The Progress of Stress Waves in a Suspended Rope Supporting a Load* which refers to the oscillation of mine cables.

Dr. Hattingh was appointed Research Engineer in 1927 and four years later

became the Technical Assistant to the late Dr. H. J. van der Bijl at that time Chairman of the Commission. He became Consulting Engineer in 1938 and was appointed a Commissioner in 1949. In February 1952 Dr. Hattingh was appointed Chairman of the Electricity Supply Commission.

It gives me much pleasure to call upon Dr. Hattingh to address you.

Dr. J. T. HATTINGH: Mr. Mayor, Mr. President, Ladies and Gentlemen: Allow me to thank this Association for the courtesy you have extended to Escom in inviting some of its members to attend this Conference.

Before saying anything else I should like to read to you a paragraph which was presented on a similar occasion in this city, a little over sixteen years ago, the brain child of a great South African and still applicable today:

"I am a firm believer in engineers coming together from time to time, especially when those engineers are municipal engineers. Some of you do your work in the larger centres, and some do your work in the smaller towns, well away from the beaten track, and, by coming together periodically, it affords you an opportunity of comparing notes and of benefitting by one another's experience. We know that every electrical engineer does his best for his own community, but, by being afforded this opportunity of meeting others, they can render even better service to their own communities, and thereby the whole country benefits."<sup>\*</sup>

Much water has flowed under the bridges since Dr. van der Bijl in his wisdom uttered these words and we of this generation should feel proud to thank him and his contemporaries, referred to in this quotation, for the foundations they have laid in fine tradition by their co-operation.

The Electricity Act of 1922 lays down fairly definitely the respective rights of Local Authorities and of Escom, but success only followed as a result of the wise foresight and willingness among the parties to co-operate under conditions where numerous chafing spots could have arisen because of common contacts.

Let us look back and see how the waters under the bridges have swelled since those days.

Hitler, Mussolini and his ilk and the terrible war they planned have come and gone and the world is just entering upon its final stage of recovery. Even Stalin has departed to the land of his fathers and of the triumvirate of Yalta only the most colourful one remains. But the cynical true statement of a ruthless dictator, that the greatest advancements are engendered by wars, is reflected in the growth since 1936 of electricity production in the world at large and in the Union of South Africa in particular.

The tabulation below shows the units during the years 1936 and 1951 in different countries and in relation to some Local Authorities and Escom in South Africa.

After various attempts and comparative failures in Great Britain arising from divided interests among suppliers of electricity and the inability of the Electricity Commissioners to bring general order out of comparative chaos, the British Electricity Act of 1947 was finally passed. Although the testing prods of time have not been applied for a sufficient period, one would generally expect a favourable verdict, especially when one compares that Act with our own Electricity Act of 1922, keeping clearly in mind the relative influences of magnitude, and remembering what the consequences of the 1922 Act have been.

But however effective legislation might be, it is in the administration of the law that the real test and chance for success lie, and here it is where the co-operation in the Union between the Local Authorities and Escom has been so successful. We believe it is partly at least owing to the fact that the Commission is a non-profit making body, and so there is no excuse for anybody to suspect us of overcharging them, and when suspicion is removed, faith rules and only co-operation can ensue among reasonable and conscientious men.

The executives of Escom and the Local Authorities realised this early on and co-operation was soon established in the form of joint authorities or in bulk supplies or exchange supplies. In this respect one would mention by name only the larger Local Authorities such as Cape Town, East London, Durban, Pietermaritzburg,

\* Dr. H. J. van der Bijl's address to the Association of Municipal Electricity Undertakings — November, 1936.

## UNITS (IN MILLIONS)

By	Designation	1936	1951	Growth Ratio
U.S.A. ....	Generated	109,316	370,234	3.4
Britain ....	Sold	14,686	50,417	3.44
Union of South Africa ....	Sold	4,361	10,500 (Est.)	2.54
Johannesburg ....	Sold	190	790	4.16
Pretoria ....	Sold	60	410	6.83
Cape Town ....	Sold	145	508	3.5
Durban ....	Sold	147	429	2.92
Escom ....	Sold	1,688	7,457	4.40

Johannesburg and Pretoria, but there are some of the smaller Municipalities who have co-operated very willingly with Escom in helping it to make available "a cheap and abundant supply of electricity", as enjoined by the Act.

It would not be out of place here to refer to the very close co-operation that has existed with the Mining Industry and other Industries, the South African Railways and Harbours Administration and the Postal Authorities and the (now defunct) Victoria Falls and Transvaal Power Company. To all, organisations and their employees, whether mentioned by name or not, we desire to express our sincere appreciation for their help and consideration.

There are unfortunately a few cases on record where certain consumers have made matters difficult for us. I hope the reasons were that they did not fully realise how Escom's actions are circumscribed by the Act and that there was no real need for their suspicious attitude.

And now what of the future? I believe only men who feel they have a special calling in life will risk prophesying, for such predictions can go so wrong.

In 1910 Professor Broom predicted that by 1950 there would be only 100,000 white people in South Africa. How wide of the truth his predictions were must be obvious to anybody, unless the professor was making

use of wordplay, in which case I venture to say he was guilty of an over-statement!

Again, in 1903 Sir Robert Kotze predicted that the value of gold produced in 1939 would be £27,000,000 per year. He assumed, of course, the basic value of £4.2477 per ounce ruling at that time. On the price ruling in 1939, at £7.7649 per ounce, the value was actually £100,000,000 and corrected for the change in price Sir Robert's figure would have been £49,300,000.

Not only is it risky to prophesy, but it is always safer to express quantity of gold by weight.

In spite of these lessons and without any claim to prophetic vision, I should like to say, provided we can effectively improve farming methods, especially among the Bantu, enhance productivity of the South African soil and arrange for sufficient water supplies, then in view of our enormous coal and mineral resources, South Africa undoubtedly has an excellent future. But, there still remains the important proviso that we co-operate not only in the field of electricity supply but in all matters relating to our activities.

It must be remembered that there are many enemies envious of our happy state and success—and to repeat—not only in the field of electricity supply, but in all matters.

The lessons of history are after all crystal clear, only those who are willing to work together survive and retain their



heritage; strife leads to destruction, the very antithesis of the function of engineers.

Though much of your time has been taken up already I should crave your indulgence to allow me to congratulate the new President, to thank the previous President for his service to South Africa during his term of office and to wish you all a very successful Conference.

Mr. G. J. MULLER (Bloemfontein): Mr. President: It was not without some misgivings that I agreed to propose this vote of thanks to Dr. Hattingh. He is as you know, very partial to Heaviside calculus and I am not. In spite of this difference we have, however, always been on friendly terms, and as he has chosen a non-mathematical theme this morning, my pleasure in replying to Dr. Hattingh is all the more real.

In the light of the present controversy over biennial conferences, the quotation from the late Dr. van der Bijl appears singularly appropriate. A man of vision, he saw more clearly and further than most, and where this message is now repeated by his very able successor, it would be worth bearing in mind.

Dr. Hattingh has referred to the cordial relations between the E.S.C. and municipal undertakings. This applied equally well to the old V.F.P. as I can vouch for from personal contacts with both bodies. This fellow feeling between the E.S.C. and municipal undertakings is at present more real than ever, both parties being brothers in distress, and all looking forward to the dawn of a new day when we shall have sufficient plant capacity, so that peace and quiet can reign once more in our relations.

Dr. Hattingh has mentioned electrical development in South Africa, and I may therefore perhaps be excused for drawing attention to the fact that his figures prove that South Africa has kept pace with the world. In spite of economic, geographic and international difficulties we have maintained a reasonable service, and in a world of soaring costs, the price of our product has remained comparatively unchanged. It would be interesting to speculate what the profit on electricity in South Africa would have been had the cost increased in proportion to say the cost of a house, a suit of clothes, a pound of rice, etc.

Electrical engineers also make mistakes and have been known to underestimate

the demand in say ten years. It was therefore, very wise and helpful of Dr. Hattingh to refer to famous people who also erred in this way. In spite of this they achieved greatness in their own sphere, and who knows, so might we!

Did Dr. Hattingh perhaps have a dig at councillors in stressing the need for co-operation in *all matters*. He could not possibly have referred to engineers who are forthright, have no politics and will co-operate with everyone including their councils!

With these few remarks Dr. Hattingh—may I tender to you our sincere thanks for your address. I am sure the pervading spirit of goodwill and optimism will not go unheeded.

PRESIDENT: I would like to call upon Councillor J. W. Phillips (Bulawayo) and also acting Chairman of the Rhodesian Electricity Supply Commission, to second the vote of thanks.

Councillor J. W. PHILLIPS: Mr. President, Ladies and Gentlemen: I am very grateful indeed to have this opportunity to say a few words in seconding the vote of thanks so ably proposed by Mr. Muller.

I was present at the 1936 Convention; I remember it very well indeed, as it was my first Convention. I remember Dr. van der Bijl's address, which interested me very much. It just so happened that the Rhodesian Electricity Supply Commission also commenced in that year, just a few months before the Convention was held, under the Chairmanship of that grand man and Engineer and a Past President of this Association, one you all know and will remember with affection, Aubrey Metelerkamp.

I was not associated with the Commission in those days; I have since become associated with it, and I am very glad to have had the opportunity, in a small way of helping to build up that organisation.

We are very grateful to Dr. Hattingh for his address, and particularly for the figures he has produced for you. These are very illuminating. I cannot give you any comparison, so far as the Rhodesian Electricity Supply Commission is concerned, because, as I have just mentioned, we only started in 1936.

We are, however, growing very rapidly; we have not reached any great magnitude

yet, as the whole of the electricity generated in Southern Rhodesia is only just about equal to that of Johannesburg. Although we are not yet very big, we are progressing rapidly; because as we only started from the beginning of the comparative period that Dr. Hattingh has taken, our rate of progress has been obviously infinitely greater than Escom. I would say, too, that, although like Dr. Hattingh I do not wish to prophesy, I am sure that in the very near future we shall make very rapid strides.

You have probably heard something about our new Federal State which is about to come into being. Under the Federal Government, the national generation of electricity will be a Federal function; in other words, the activities of the Commission will probably be spread over the three Territories; and we shall, therefore, in all probability be responsible for the hydro-electric schemes which are visualised. We have a big programme ahead of us in Rhodesia.

There is one thing that these figures Dr. Hattingh has produced do show; that is the remarkable progress of Escom in Southern Africa; and I think that he, his predecessors and staff are to be congratulated on building up such a fine and efficient organisation.

I was very interested listening to Dr. Nicol's address when he urged that more power lines should be run out to farms and rural areas. Now, that is something that we have gone out for in rather a big way in Rhodesia. We have not waited for applications to come in from farms or the rural areas; we have taken the lines out; we have created a Sub-Department whose job it is to go out and sell electricity to these places; and that has been a great success.

Well, Dr. Hattingh, I would like to associate myself with the remarks of Mr. Muller, and to again thank you, on behalf of the Association, for your kindness in coming along and addressing us to-day.

**PRESIDENT:** The Convention will be adjourned at this stage (11.45 a.m. until 2.30 p.m.) to enable delegates to attend the launching of an appeal by His Worship the Mayor for the Queenshaven Rest Home.

**PRESIDENT:** Ladies and Gentlemen: When it became known to me that Mr. Beard's visit to Johannesburg would coincide

with the Convention I took it on my own to approach Mr. Beard as to whether he would be good enough to address our Association. In introducing Mr. Beard to you I would like to say that Mr. James R. Beard, C.B.E., M.Sc., M.I.C.E., M.I.E.E., Fel.A.I.E.E., is the Vice-President of the British Electrical Power Convention, 1952-53.

On the formation of the C.E.B. he took charge of the construction of the Grid in the eastern half of England and, in 1940, succeeded Mr. Merz as Senior Partner after the latter's tragic death in an air raid in 1940. He has been a member of the Panel of Technical Advisers to the North of Scotland Hydro-Electric Board since its formation in 1943.

Mr. Beard was President of the Institution of Electrical Engineers in 1940 having previously been Chairman of the N.E. Centre in 1920. Member of Council, 1927-30 and 1934-37 and Vice-President 1937-40. He was Chairman of the Electrical Installations Study Committee set up by the Institution for the Ministry of Works and was associated from its inception with the Council for Codes of Practice for Buildings. In 1945-46 he was Chairman of the Association of Consulting Engineers and President of the Association of Supervising Electrical Engineers during 1938-40.

I have much pleasure in calling upon Mr. Beard to address you.

#### **ADDRESS BY MR. JAMES R. BEARD, C.B.E., Vice-President—British Electrical Power Convention**

Mr. President: Although I am making my fourth visit to the Union, it is the first that has coincided with your Convention. I therefore looked forward to the opportunity of attending, particularly in a year when my very good friend, Mr. Fraser, whom I first met when I came over in 1936, is your President. I had, however, expected to attend in quite a private capacity, and was, therefore, somewhat taken aback to receive an invitation from Mr. Fraser, on behalf of his Executive Council, to address a few words to you in my capacity of Vice-President of the British Electrical Power Convention in the U.K. I, personally, and my colleagues on the Council of the B.E.P.C., deeply appreciate the honour of such an invitation. When I reported it to them, they asked me to convey their appreciation to you and to

give you their most cordial good wishes for the success of your Convention.

Your President thought it might be of interest if I were to tell you something about the similar Conventions which have been held in the U.K. I rather imagine that your own Association was originally modelled on our Incorporated Municipal Electrical Association—always called the I.M.E.A. Although it was not incorporated till 1901, this was founded as long ago as 1895, when electricity supply was very much in its infancy. Arthur Wright of Brighton was the first President, and his undertaking had a capital expenditure of £160,000 and was proud of selling nearly one million units a year. The objects of the I.M.E.A. were very wide and of much the same character as I judge yours to be. In practice it resulted, as in your case, in an Annual Convention for the reading of papers and a number of Committees of the Council who dealt with such matters as tariffs, wiring regulations, standby plant, proposed Parliamentary Bills, etc. However, its most useful work was probably the "Joint Committees" formed with the Associations representing other sections of the Industry, for the purpose of examining problems of mutual interest. Such other sections were allowed to send representatives as visitors to the Annual Convention.

However, the I.M.E.A., after 52 years of valuable work, automatically became a thing of the past with the Electricity Act 1947, which gave effect to the Labour Government's declared policy of nationalisation of coal, transport, electricity and gas. As a consequence, on vesting date, 1st April, 1948, all the municipal and company electrical supply undertakings in Great Britain (except in North Scotland), and the Central Electricity Board set up under the 1926 Act, passed into the ownership and control of the British Electricity Authority and the fourteen Area Electricity Boards. The proposals had been fought strongly by the companies and many municipalities, but, once the Act was passed, the managements and staffs all co-operated with the new Authority so closely and cordially that the transfer was effected with surprising efficiency and a minimum of dislocation.

It may be of interest to tell you a little about the new set up which has now been

operating for five years. The British Electricity Authority is appointed by the Minister of Fuel and Power, and its present members are the Chairman, Lord Citrine, who had been for many years Secretary of the Trades Union Congress, the Deputy Chairman (Administration), Sir Henry Self, who had held leading positions in several branches of the civil service—including War Supplies at Washington, the Deputy Chairman (Operations), Sir John Hacking, who was previously Chief Engineer of the Central Electricity Board, four part time members—one of whom is a lady—and four of the Area Board Chairmen who serve in rotation. The Authority owns and operates all generating stations and transmission lines, and gives bulk supplies to the Area Boards.

The fourteen Area Boards are also appointed by the Minister, and are autonomous self-governing bodies, who are responsible for the distribution and sale of all electricity in their areas. They are, however, co-ordinated, and their general policy controlled, by the British Electricity Authority, who also provide them with the capital they require. The Authority issues British Electricity Stock on the market from time to time to cover all the requirements of the Authority itself and the Area Boards.

In each Area, there is also a Consultative Council appointed by the Minister, of whom over half are appointed from persons nominated by local authorities, the remainder representing other consumer interests. The Chairman of the Council is a member of the Area Board, and the Council is charged with ensuring that consumers' requirements are fully considered by the Board.

Under the new set-up, many of the functions previously carried out by the I.M.E.A. have become internal affairs of the Authority, but it was widely felt that the Annual I.M.E.A. Convention had played an important part in achieving the excellent relationships which had become the heritage of the British Electricity Authority and the Area Boards. Lord Citrine, in particular, when shortly after his appointment he attended as a guest the Convention in 1947 was much impressed by its value in promoting and maintaining a spirit of friendly co-operation, not only in the electricity supply industry itself but with other sections of the electrical

industry as a whole. He therefore decided to call a representative gathering to consider the possibility of developing the former I.M.E.A. Convention into one covering the whole electrical power industry. The idea met with a favourable reception, and, at the last I.M.E.A. Convention in 1948, it was announced that such a National Convention would be held in 1949. This proved highly successful and has now become a firmly established annual event. The President of this first British Electrical Power Convention was naturally Lord Citrine who had done so much to foster the idea, and he arranged for the organisation of this first Convention to be undertaken by the British Electricity Authority, who placed at the disposal of the first Council the services of Mr. Simpson who had been for many years Secretary of the I.M.E.A., but was then on the Authority's staff. Nevertheless, from the very first, Lord Citrine took great pains to avoid the new Convention becoming looked upon as a B.E.A. baby, and I think you would like to know something of the way in which it is organised so as to be truly representative of the whole electrical power industry.

In the first place, it was obvious that there could not be an open invitation to all and sundry, as there are limits to the size of convention which can be accommodated, even at such places as Torquay, Bournemouth, Eastbourne or Harrogate, which specially cater for conventions. The scheme adopted for ensuring adequate representation of all sections was to restrict membership to the electrical organisations participating in the original discussions, and such additional organisations as the Council might invite. Individuals or individual electrical firms are not eligible for membership. At present the member organisations are:—

(1) *On the supply side:*

The British Electricity Authority and the Area Boards, the North of Scotland Hydro-electric Board, five separate electricity undertakings outside Great Britain in Northern Ireland, the Isle of Man and the Channel Islands and the Employees' National Committee (Electricity Supply Industry).

(2) *On the manufacturing side:*

The British Electrical and Allied Manufacturers' Association, the Cable Makers'

Association, the Water-tube Boilermakers' Association, the Electric Lamp Manufacturers' Association, the British Refrigeration Association and the Electrical Wholesalers' Federation.

(3) *On the installation side:*

The Electrical Contractors' Association, the Electrical Contractors' Association (Scotland) and the National Register of Electrical Installation Contractors.

(4) *A number of general bodies:*

The Institution of Electrical Engineers, the Association of Consulting Engineers, the Electrical Research Association, the Electrical Development Association and the Electrical Association for Women.

These organisations are each allotted a certain number of delegates, based primarily on their respective size and importance. At present the number of allotted delegates is 830, of whom the supply side (including the Consultative Councils) account for 392, the manufacturing side for 345, the installation for 42 and the general bodies for 51.

The Council consists of seven persons nominated by the B.E.A. and Area Boards, and one by each of the other 17 principal members, together with the President, Vice-President and the Past Presidents of the two preceding conventions.

As I have already mentioned, the first president was Lord Citrine; he was followed in turn by Sir Vincent de Ferranti, Sir Henry Self and Mr. P. V. Hunter. This year we have Sir John Hacking, with myself as vice-president. You will see, therefore, that the policy of making the convention truly national extends to the chief officers, who so far have been three from the supply side, two from the manufacturing side and one consulting engineer.

The finance is provided by contributions from member organisations of £2 per allotted delegate, plus a fee of £3 from each delegate attending and a fee of £1 for each visitor. The visitors are mainly wives of delegates and number some 700, making with the delegates themselves, a total attendance of over 1,500.

Associated with the Convention, but outside its official scope, it is usual for the manufacturers to organise quite a large exhibition of electrical apparatus and appliances, which usually has attached to it some 3/400 representatives.

The papers presented and discussed are chosen to be of general interest to the whole of the industry, and each Convention usually covers one or two major questions of current interest. For example, this June in Torquay the general theme is to be introduced by a paper on "Electricity and National Prosperity" which will be supported by a series of four papers dealing with "Electricity and Industrial Production" and a similar series of four papers dealing with "Electricity and Food Production". Some of these are joint papers by representatives of several sections of the industry. They are consciously directed at bringing home to the more intelligent public, and especially to those in positions of authority in public life, the fundamental need for maintaining and expanding the supply of electricity if the country is to hold its own, and the consequent necessity for the Government to allocate adequate funds for this purpose when deciding—as is done in Great Britain nowadays—how the planned programme shall be allocated between industries—whether privately or nationally owned.

Like yours, the Convention occupies the best part of a week; two and half days are devoted to the presidential address and papers, half a day to the Electrical Forum and the Annual General Meeting and one afternoon to an excursion.

As with you, there are social functions, which usually comprise an evening reception held jointly with the Mayor and Mayoress of the town where the Convention is held, an official dinner and a luncheon organised by the Electrical Association for Women. At the official dinner, there is an outside chief guest—this year he is Sir Archibald Forbes, President of the Federation of British Industries—and in previous years he has been the then Prime Minister, Mr. Attlee, Mr. Batt, the Chief U.S.A. Aid Administrator in the U.K., Sir Harold Hartley, the President of the British Association and Lord Swinton, Minister for Materials.

I hope I have not bored you with too much detail about the B.E.P.C., but it is difficult to describe such an organisation adequately in a few minutes.

May I conclude by saying that there have been a few suggestions from time to time that the Convention should be reduced or shortened or perhaps held in

alternate years, but, after five years of experience, the consensus of opinion among the leading people in the industry is that it fulfills a most useful purpose. Not only does it enable subjects of national importance to be discussed by the whole industry, but even more important are the opportunities it offers for individuals to get to know their colleagues in their own and other branches of the industry.

Thank you Mr. President for the great honour your Council has done the B.E.P.C., and me personally, in giving me the opportunity to address you. May I wish you a most successful convention and a fruitful year of office.

Mr. J. E. MITCHELL (Salisbury): Mr. President, Mr. Beard, Gentlemen: May I say that although Mr. Beard has intimated it to be a great honour for the British Electrical Power Convention, and for himself personally, to be invited to this Convention and to be invited to address it, I suggest to you that it is much more of an honour for this Convention to have Mr. Beard with us, especially as he is the Vice-President of such an eminent body as the British Electrical Power Convention itself.

For those who do not know Mr. Beard, I do not think our President emphasised too well his actual associations with South Africa. Mr. Beard, as the President told you, was associated with Dr. Charles Merz who was most tragically killed with the majority of his family during air raids in London during 1940.

Dr. Charles Merz was, as you may know, associated with South Africa, I think, in the first instance, well before the first world war, in Durban, but is mainly remembered because of the work that they did on the Colenso power station and the first portion of the electrification of the Ladysmith to Durban railway. Mr. Beard is also remembered because he is the senior partner of Messrs. Merz & McLellan who have been used in a consultative capacity by the Electricity Supply Commission and municipalities in South Africa, and have been connected with some of the major power stations in this country, not the least of which is Orlando here in Johannesburg.

At this Convention, when suggestions are going around that such gatherings should only be held biennially, it is good to have examples of the workings of



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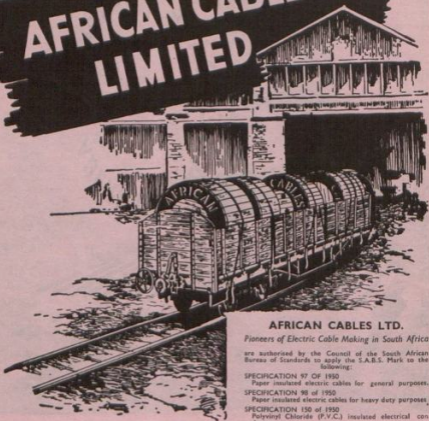
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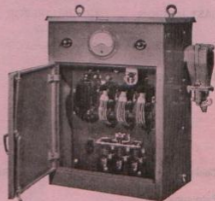
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similar functions overseas. I am sure that, if it were found, after nationalisation in the United Kingdom, great good still came from annual conventions such as this, no further evidence at all is needed of their usefulness to the undertakings and the municipalities as a whole.

I, myself, met Mr. Beard some fourteen years ago, although I had heard of and been taught the Beard-Hunter pilot system of protection long before that: and it is interesting to note that the Mr. Hunter to whom Mr. Beard referred to as one of the Presidents of the British Electrical Power Convention was that same Mr. Hunter who was associated with Mr. Beard in bringing out that well known system of protection.

When I was interviewed by Mr. Beard in his office in London, I was a comparatively junior engineer, and you can imagine that I entered with some considerable trepidation. However, I can assure you that I was soon put at ease and found him very much easier to talk to, and very much more human than a considerable number of engineers that I had met and worked for previously, and who had much less reason for putting on airs.

Mr. Beard's knowledge of electrical engineering in all aspects makes him competent to understand the widest of national problems no less than the needs of the lowest apprentice.

Mr. President, I should like formally to move the vote of thanks to Mr. Beard for his address to this convention, and I am sure I am expressing the wish of all members and visitors alike in assuring him that there is always a warm welcome here for a man who has taken South Africa so much to heart that, some time ago, he gave his consent to an alliance between the next generation of English and South African engineering families: in other words, when his daughter married a son of the late Dr. Bernard Price.

Mr. C. G. DOWNIE (Cape Town): Mr. President, Mr. Beard, Gentlemen: It is my very pleasant duty to second this vote of thanks so ably proposed by Mr. Jimmy Mitchell of Salisbury. He has, incidentally, taken a lot of words out of my mouth—(Laughter). So it makes my task, in seconding the vote of thanks, shorter and easier. But, Mr. President, speaking

as an Engineer, I consider it a great honour to be able to second this vote of thanks, because I regard Mr. James R. Beard as being one of the world's most eminent Electrical Engineers. He has contributed in no small measure to the development of electricity transmission and distribution systems and he is here with us to-day also as the Vice-President of the British Electrical Power Convention.

Mr. Mitchell has referred to the firm of Messrs. Merz & McLellan, of whom Mr. Beard is the Senior Partner. I would like, Mr. President and Gentlemen, to pay a tribute to this great firm of Consulting Engineers. Many of us know the firm, and have been guided and helped in the development of our Undertakings by Messrs. Merz & McLellan. It has done a lot towards developing Electricity Supply Undertakings not only in this country—(Hear, hear), but all over the world; M. & M. have done much good work for the British Commonwealth by the way it has developed electricity supply in those Dominions and Colonies where M. & M.'s services have been used.

Mr. President, with these very few remarks, I again wish to thank Mr. Beard for coming along to this Convention, for his fine work in the organisation of similar conventions in England; and I hope the representatives of city councils here today will read, mark and inwardly digest what he has said concerning the activities of these very valuable gatherings. They are most valuable to us engineers, and I hope that we shall continue in the future to meet every year, as we have been doing in the past.

PRESIDENT: Mr. Beard, on behalf of the Convention, may we wish you a very pleasant stay in South Africa, and, when you return back home, we hope you will take back with you very happy memories of these gatherings. To you and Mrs. Beard we wish a pleasant stay and Godspeed when you return back to the Old Country. Gentlemen, I would like you to show your appreciation of Mr. Beard's Address—(Applause.)

Mr. JAMES R. BEARD: Mr. President, Mr. Mitchell, Mr. Downie and all present here: I thank you for your very cordial welcome. I have very much appreciated coming here, and have enjoyed it.

PRESIDENT: Gentlemen, we now pass on to the Retiring President's Valedictory Address. I have very much pleasure in calling upon Mr. Sibson to give you his Valedictory Address.

### VALEDICTORY ADDRESS

By

A. R. SIBSON, A.M.I.E.E., A.M.I.Mech.E.,  
M.(S.A.)I.E.E.

Ladies and Gentlemen: Twelve months ago I spoke to you about the political background of Municipal Government and stressed the need for Municipal Electrical Engineers to recognise the communal source of their authority. Today I want to direct your attention to other growing responsibilities that have overtaken us, almost unawares, and which are becoming even more important than the sociological principles upon which I am accustomed to place so much emphasis.

When many of us were young we selected electrical engineering as a career because we were attracted by the romance of the unknown. Electricity was little more than an exciting novelty with potentialities then vaguely apprehended. A certain amount of useful applications had become common practice even in some of the smaller towns, but, while failure of supply gave rise to annoyance, no one would have suggested that prolonged cessation of supplies could have been thought of in terms of a national calamity. The world in which we live today, however, has taken advantage of every advance in engineering procedure to an almost incredible extent. In a thousand and one applications the electrical way of doing things has been adopted and the older procedures have fallen into disuse or been eliminated entirely with the result that a generation has grown up which is incapable of carrying on the civilized life of the nation without the new-fangled tools that electricity provides.

Nearly half a century ago Rudyard Kipling wrote to say that Transportation was Civilization: but this was before communities became dependent upon electricity. Even so, without electricity much of a country's transport today would cease to operate. Apart from those systems that derive their motive power from electrical sources, electrical signalling devices are amongst the many modern refinements

of which advantage has been taken to make the machinery of transport more efficient. The more the world depends upon machines the more inflexible does its capacity to meet emergencies become. When the world's work was carried out for the greater part by human and animal labour, reservoirs of latent effort existed that could be brought to bear, even for prolonged periods, in the event of abnormal demands being made. No such safety margin exists today. The world's work is being carried out by machinery and equipment of which very full use is already being made. The slightest hitch anywhere and the output will be reduced, and in most cases there is nothing that can be done to restore the balance until the equipment is fully available again. Visualize a cessation of power supplies on the Reef for a period of a week or more, from the point of view of transport alone. Electrically operated trains, trams and trolley buses would cease to run and daily travellers would have to seek other means of getting to and from work. Bus services are already overcrowded so perhaps private cars would be called into use. Where would they be parked? And with the greatly increased consumption of petrol that would result how would filling stations cope without electrically operated petrol pumps? In any case the Railways would have slowed down to the pace that hastily improvised manual signalling and limited steam locomotion could cope with, and supplies of petrol might not be possible for anything but the most essential purposes.

But, in fact, there would be little need for the majority to try and get to work, for the factories, mines and workshops would have closed down. Even the offices, without their calculating machines would be unable to cope with one-tenth of their output and it would not be worth-while to attempt to keep going to any extent, even though one or two of the machine operators might still be capable of adding, subtracting and multiplying without a keyboard. Newspapers would cease to be published, broadcasting stations—even if equipped with standby supplies—would serve little purpose when no one could listen to them. Dark streets would encourage lawlessness, already engendered by enforced idleness, to an unprecedented extent. Very quickly the essentials of

life would run out. No flour or bread would be available, meat could not be stored nor could any food be cooked. Water supplies would peter out and sewerage systems would cease to operate. Civilized urban life would, in other words, rapidly become impossible and we should expect to see thousands of refugees trudging hopelessly out into the country to find the wherewithal for the barest existence. We should see again those sights associated with all-in war such as were witnessed after the bombing of Warsaw.

It is a sobering thought that only the electrical engineers of our cities stand between the community and such a prospect as this. Now and then, when we are surveying coal bunkers that are almost empty, we are brought face to face with grim realities and if we seem at times to be overwrought, it is only because we are so conscious of the responsibilities that rest upon our shoulders: responsibilities for the supply of a commodity which, though sometimes restricted, has never yet failed for more than a few hours and has therefore come to be regarded by the community almost as reliable as the air it breathes.

But while the public are dependent upon us for almost the whole of the substance of modern civilization, we are in turn dependent upon those who manufacture and maintain the plant required for the generation and distribution of electricity, and it is against the rather gloomy background that I have painted that I view with concern the tendency towards lowering standards of workmanship in many of the manufacturing countries. There can be no doubt that the change from the cut-throat competition in the years between the wars to the associations of both capital and labour—designed with the highest motives—which are now the order of the day, has coincided with a marked reduction in the quality and reliability of manufactured products. There may be no connection between the two things, or there may be many other factors responsible for the deterioration that is becoming evident; but whatever the causes may be it behoves both manufacturer and user to give serious thought to the problem, before it passes beyond the realm of petty annoyance.

Modern plant depends to an increasing extent upon tolerances that precision tools, made and operated by high-class craftsmen, have made possible. In the limit it is the pride in workmanship on the part of men and women in the design offices and the factories that is the foundation of our twentieth century way of life. There is a danger of this being overlooked in a Society where the emphasis on individual responsibilities is lessening whilst the stress on the individual's rights is being enhanced. In our own countries this symptom is by no means entirely absent and in the long run can only be combatted on the individual level. Failing the unlikely emergence of a generation of people that aims always at the highest achievements without thought of personal rewards, incentives of some sort are essential, to ensure that both management and labour give of their best.

What are the implications of these considerations on the Undertakings for which we are responsible? As purchasers of millions of pounds worth of capital equipment it is our plain duty to ensure that the quality of such equipment is of the highest available standards and this unfortunately is no longer automatically guaranteed by virtue of origins that have acquired a high reputation in the past. Our responsibilities in this matter have greatly increased. It is becoming necessary for us to exercise the greatest vigilance in the preparation of specifications and in seeing that they are carried out. Nothing should be taken for granted: clearances may be wrong; materials may be faulty; even designs may contain fundamental errors. It would be very wrong for me to suggest that our friends in the manufacturing field are not equally concerned with the problems to which I am drawing attention. They are themselves waging a constant war against very heavy odds and I am sure they would welcome the support that purchasers can provide by demanding first-class quality and workmanship.

But we need to keep an equally wary eye on our own households. High operational and maintenance efficiencies do not come into existence without effort and we cannot expect to remain untouched by modern tendencies to laxity. In the majority of human activities deteriorating standards merely mean annoyances and increased

costs: in power supply undertakings they may have much more serious results. Here there is no room for the dead hand of the uniform dehumanised procedures which inevitably proliferate when public organisations become large and which equate human effort at the level of the lowest common denominator. Similar situations have always existed in those islands of civilization that daily ride upon the high seas on their lawful occasions; and in the case of naval vessels, at any rate, the solution is found by the application of strict disciplinary codes associated with a generally accepted status that attracts personnel in spite of the rigours to which such discipline subjects them.

It seems to me that the time is fast approaching when it will be necessary for the community to recognise the vital nature of electricity in the maintenance of its own security, and create conditions that ensure that the best possible personnel is recruited into the ranks of Power Supply staff establishments. Such conditions would have to be of a sufficient standard to permit a high degree of discipline to be enforced without the danger of staff seeking less onerous employment elsewhere. Municipal Councils would have to face the challenge introduced by the necessity of differentiating between employees in the various departments and of vesting a Head of a Department with authority comparable with that of a Ship's Captain, while the electrical engineers would have to face the equivalent of a court-martial if such authority were abused.

These are the inevitable implications that arise from the almost complete dependence of a whole community upon a single organisation for its very existence, and it is this dependence that has underlined the importance in most countries of linking up as many generating sources as possible in order to spread the risk to the utmost extent. But it will be a very long time before much security is achieved in this way by many of the widely separated centres of Southern Africa, and, in any case, only the barest essentials are likely to be catered for even then, unless a tremendously expensive super-grid were embarked upon. Indeed it seems probable that the Rhodesias will comprise the first really extensive area in Africa to be embraced by a comprehensive transmission

system that will go a long way towards reducing the risks of individual generating failures to proportions whose impact on the community will be less drastic.

I have spoken about the need for attracting the highest quality of personnel into the ranks of the Power Supply industry and I now want to add that I am most concerned about the growing paucity of qualified and experienced mechanical engineers in generating stations. Engineers joining Supply Undertakings are nearly always Electrical Engineers with a penchant for Transmission, Distribution or Light Current work. Apprentices very rarely express a preference for generation as a career. The greatest difficulty is experienced in providing operational staff for Power Stations. This is a situation that has simply got somehow to be rectified very soon for in many cases it is only the old hands who are now holding the fort. I can remember, shortly after the first World War, how University graduates sought employment as junior control attendants on the V.F.P. system and from such positions climbed the ladder as operational men to senior posts in the Company's service. The seller's market in labour has to a large extent altered this state of affairs but I think the well-known diffidence of power engineers to advertise themselves and the importance of their work has led to a lack of public consciousness of the vital nature of this class of occupation. But Power Supply, as the most fundamental factor in modern civilization, cannot be permitted to take its place in the queues at labour registry offices or be subject to the normal ebb and flow of labour supply. Direction of labour is a thing that all right-minded persons will avoid as the plague and the only alternative, therefore, is to make employment in the Power Supply industry—and particularly in generating stations—socially and economically attractive. It is illogical and suicidal for a community on the one hand to place its whole life in the hands of Power Engineers and on the other not to encourage its best members to serve within their ranks. It would take many years to train new entrants to the stage that they are able to take responsibility: if we wait until the need becomes obvious for all to see, the situation is bound to become still worse before any improvement can be expected

and this is a state of affairs that no modern nation dare contemplate.

In spite of the habitual diffidence to which I have referred I feel that it is time one of us drew public attention in no uncertain manner to the dangers that our peoples are courting, dangers which up to now have largely been avoided by the practice of public service on the part of members of a generation that was brought up in an environment that still placed the first emphasis on individual responsibility. If I succeed in fulfilling this purpose, the opportunity afforded me by my occupation of the Presidential chair of our Association for the last year will not have been wasted.

I should like to conclude by expressing my warmest thanks to the Association for the honour that it conferred upon me a year ago, to the Secretary, the members of the Council, and particularly Mr. Fraser, for their stalwart service during the year. It was inevitable that many of the problems that required attention were matters with which I, as a Rhodesian, was less familiar, and Mr. Fraser has done sterling work, together with the Reef members of the Council, in looking after your more domestic interests. It is with the very greatest pleasure that I hand the chain of office to Mr. Fraser for I know how well he will sustain the responsibilities that devolve upon him.

Mr. C. R. HALLE (Pietermaritzburg): Mr. President, Gentlemen: I think we all know Mr. Sibson as Engineer, and as a Musician, and today we have met him as Philosopher, and I think we must respect him in each of these three roles.

The subject of his paper is a very deep one: and I think some of us are beginning to put more faith in mechanisms and materials than we have in our fellow man, forgetting that it was creative man who made those machines.

Frankly, I do not know what the derivation of "Sibson" is, but I like to think of it as a "Son of Sib." Perhaps this mysterious gent. was a High Priest of some Egyptian Temple where, night and day, he guarded the sacred flame of Wisdom. Now, today, we have our High Priest guarding a much more sacred flame because, if that goes out, we are left in greater darkness: more so than the ancient Egyptians.

Anyway, I think it is unnecessary for me to elaborate on the very fine paper Mr. Sibson has given us; he has fulfilled a very fine year of office: and I think that, if we believe that perhaps the real reason for our existence is creation, there is no alternative to the vital instinct that makes men create these wonderful Power Stations. I do think that Mr. Sibson has put a grand note to the end of his year of office that we will not forget. Thank you. I have great pleasure in moving the vote of thanks for his very fine address.

Councillor W. H. HARRISON (Johannesburg): Mr. President and Gentlemen: I have much pleasure—and I mean much pleasure—in seconding the vote of thanks to Mr. Sibson.

Like Daniel in the den of lions, knowing nothing about Electricity, I have been greatly taken with what he has said in his paper. As a matter of fact, as a Councillor—and I would advise the other Councillors here to do likewise—I would very quickly say, "Yes, you can have the odd Convention once a year; otherwise we are going to be in a lot of trouble." But it has given me food for thought; and I can assure you that, if it has given me food for thought, it will give you experts much food for thought. It is a great pity that anybody ever suggested you were having too many Conventions. After all, a little nonsense now and then, is relished by the wisest men; and I enjoy conventions just as much as does anybody else. There are very many good high-spots in a convention.

The power is with you; and it is a great shame, I think, in many respects, that you are Public Utility Corporations—that you are what you are, instead of belonging to Private Enterprise. I am quite satisfied that, in Private Enterprise, you would be paying a dividend; you would be giving bonuses; you would be getting much better treatment than you are getting today. So it does say much for your sense of duty, as pointed out by Mr. Sibson, your sense of loyalty, your gratification in the job that you do, that you continue in it. No wonder that you find difficulty in getting recruits to do the job that you will leave behind some day. But still, perhaps it is a good thing that it belongs to the people; the shareholders of your co-operation are your fellow men. Perhaps it is a good thing that you all work together.

I am particularly perturbed, too, when he mentioned the bad standard of workmanship that takes place throughout the world. Here, too, I would like to issue my word of warning, that perhaps we are to blame. Is there anyone here who has not said in front of his children that "My boy is not going to work as hard as I have done. He is going to get a better chance in life than I have done"? Is that a good thing? Perhaps we lay too much emphasis on the white collar job rather than on production and the will that you went into your particular job.

I think I can promise you, on behalf of the Johannesburg Municipality, Mr. Sibson, that a Convention will be held, so far as we are concerned, once a year. I have no authority for that statement; I give it as my personal view, and I say it willingly because one has a certain sense of responsibility, and we will never say, "Have one every two years." The position is too vital; the conditions under which you work are too vital.

We have heard an address from Mr. Beard; we have heard addresses from other people on your wonderful Consultants, your wonderful ideas, your wonderful machines; but there has been no address on commonsense: and with all the manufactures, with all the wonderful inventions that take place, I doubt if there is anything that can take the place of commonsense in a time of emergency. Therefore, the trainees and you and your jobs are still of very paramount importance.

I am very pleased to be here this afternoon. I know nothing about electricity, except that I press a switch and I get a light. I think perhaps it is just as well that, in the hands of such experts as you, it ill-behoves the public to know too much about such a dangerous weapon as we have.

May I just, at this stage, say how pleased I am that we have such a man as Mr. Sibson who will take the courage to place these things in such a Valedictory Address as this. I shall treasure this address; and, although I have not been connected with Electricity for years, as I said before, I shall take every opportunity to find out what your other Presidents are saying. I feel certain that this will go a long way to smoothing a lot of your difficulties. I do second the motion with all the sincerity of which I am capable. Thank you.

PRESIDENT: Mr. Sibson, you have heard the proposer and seconder. May I be privileged to add my quota of thanks to what has already been said by these two gentlemen?

Mr. Sibson has put in a tremendous amount of work during his year of office. The fact that he has been so far away from secretarial headquarters has made his task no light one.

Mr. Sibson, on behalf of the members of the Association I offer you our thanks for your sterling work during your year of office: and we now promote you to the very high office of Past President.

#### ELECTION OF EXECUTIVE COUNCIL

PRESIDENT: The next Item is the appointment of the new Executive. The position at present, as you will see in your Agenda and Programme—it has been slightly altered since it has been printed, as you know, by my being appointed President this morning. You have your President, and as Vice-President, Mr. Muller, from Bloemfontein; Past Presidents, Messrs. A. R. Sibson (Bulawayo) and J. C. Downey (Springs). Then, on your Executive, you have five members: Messrs. Bradley (Port Elizabeth); Downie (Capetown); Kinsman (Durban); Mitchell (Salisbury); van der Walt (Krugersdorp). Mr. Muller, being elected Vice-President, has created a vacancy on the Executive. All the Executive members automatically relinquish office today and are eligible for reappointment.

I would like to stress what is always stressed at this time during our Conventions, that a great deal of the work of the Association unfortunately has to be done in the Witwatersrand area; and, if we can keep a balance by having men appointed in each Province, we will be quite happy. I now ask for nominations for a new Executive.

There were eight nominations, duly proposed and seconded, as follows:—

- Messrs. C. G. Downie (Cape Town).
- C. Kinsman (Durban).
- J. E. Mitchell (Salisbury).
- J. L. van der Walt (Krugersdorp).
- D. J. Hugo (Pretoria).
- A. Foden (East London).
- F. Stevens (Ladysmith).
- D. A. Bradley (Port Elizabeth).

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA  
BALANCE SHEET — 28th FEBRUARY, 1953

Accumulated Funds ... ..	£2,477 11 6	Presidential Badge ... ..	1 0 0
Balance at 29th February, 1952 ...	£2,528 16 10	Nominal Valuation	
Less: Excess of Expenditure over		Furniture and Fittings ... ..	63 17 9
Income for year ended 28th		At cost less depreciation	
February, 1953 ... ..	51 5 4	Investments ... ..	2,113 14 6
Creditor ... ..	1 1 3	United Building Society Fixed	
Chairman: A. R. SIBSON.		Deposits including interest accrued	
Secretary/Treasurer: A. T. TAYLOR.		Debtors ... ..	28 11 0
		Cash ... ..	271 9 6
		Barclays Bank (D.C. & O.)	
	£2,478 12 9		£2,478 12 9

To the Members of the Association of Municipal Electricity Undertakings of Southern African:

We report that we have examined the above balance sheet with the books and vouchers of the Association for the year ended 28th February, 1953; that we have satisfied ourselves of the existence of the securities; and certify that, in our opinion, the above balance sheet is properly drawn up so as to exhibit a true and correct view of the state of affairs of the Association as at 28th February, 1953, according to the best of our information and the explanations given to us and as shown by the books of the Association.

(Sgd.) SAVORY & CO.  
Incorporated Accountants.  
Auditors.

Johannesburg,  
16th March, 1953



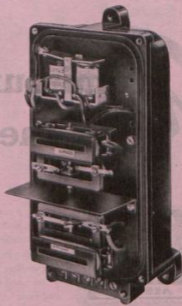
ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA  
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 28th FEBRUARY, 1953

Audit Fees ... .. .	£8 8 0		
Bank Charges ... .. .	10 9 6	Subscriptions ... .. .	£1,017 19 6
Convention Expenses ... £226 6 1		Interest on Fixed Deposits ... .. .	58 17 6
Less: Donation ... .. .	2 2 0	Donation ... .. .	2 2 0
	224 4 1	B.E.A. Journal ... .. .	4 6
Depreciation of Furniture and Fittings ...	7 2 0	Subscriptions Received ... .. .	£1 16 0
Insurance ... .. .	2 9 0	Less: Cost ... .. .	1 11 6
Printing and Stationery ... .. .	17 5 1	Excess of Expenditure over Income transferred to Accumulated Funds	51 5 4
Postages and Telegrams ... .. .	24 6 10		
Rent ... .. .	48 0 0		
Secretarial Expenses ... .. .	89 7 4		
Secretary's Salary ... .. .	487 7 0		
Telephone ... .. .	14 10 4		
Executive Committee Expenses ... .. .	66 17 6		
Subscriptions ... .. .	22 17 6		
	£1,023 4 2		
Proceedings ... .. .	107 4 8		
Cost of Printing ... .. .	672 7 2		
Less: Sale ... .. .	185 5 0		
Advertising— Net ... .. .	379 17 6		
	565 2 6		
	£1,130 8 10		£1,130 8 10

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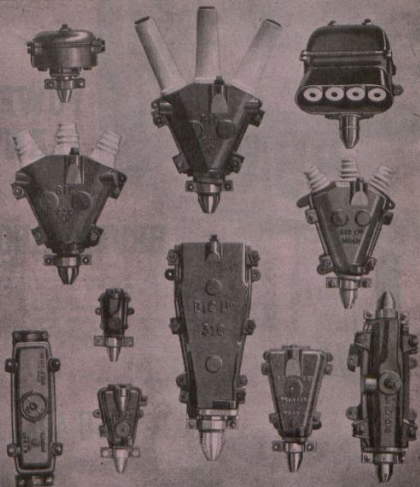
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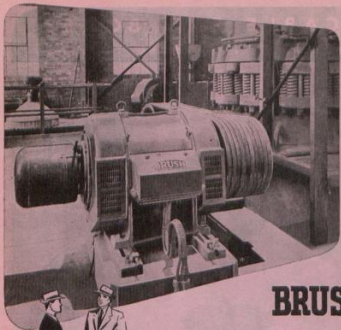
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JOHANNESBURG



**MEMBERS OF EXECUTIVE COUNCIL, 1952/53**

Standing (Left to Right): Councillor A. Markham (Port Elizabeth), C. G. Dwyer (Cape Town), Councillor H. L. Richardson (Durban), Councillor M. C. Dumas (Durban), K. W. de Waal (K. W. de Waal), Councillor G. A. Frensch (Bloemfontein), Councillor A. Morton Jaffray (Salisbury), J. E. Mitchell (Salisbury), Seated (Left to Right): C. Kinnaman (Durban), D. A. Bradley (Port Elizabeth), G. J. Malher, Vice-Chairman (Bloemfontein), J. C. Fraser, Chairman (Johannesburg), A. B. Sibson (Bulawayo), A. T. Taylor, Secretary/Treasurer, J. C. Dowry (Springs).

**PRESIDENT:** Gentlemen: I will ask the scrutineers to collect the ballot papers, and will let you know the result of the ballot tomorrow morning.

(Convention adjourned at 4 p.m. for the taking of the official photograph, until 9.30 a.m. tomorrow).

## SECOND DAY

WEDNESDAY, 22nd APRIL, 1953

**PRESIDENT:** Good morning, Gentlemen. I will now declare the result of the ballot, which was held yesterday afternoon, for Executive Council members. The complete list of Executive Council members including those balloted for is as follows:—

President, J. C. Fraser, Johannesburg; Vice-President, G. J. Muller, Bloemfontein; Past-Presidents, A. R. Sibson, Bulawayo; J. C. Downey, Springs; Engineer Members, D. A. Bradley, Port Elizabeth; C. G. Downie, Cape Town; C. Kinsman, Durban; J. E. Mitchell, Salisbury; J. L. van der Walt, Krugersdorp; D. J. Hugo, Pretoria.

The towns which are represented on the Council—and I would like Councillor members to please note this, as the next meeting of the Council will be held tomorrow morning at half-past eight, in the Committee Room next door—are Johannesburg, Bloemfontein, Port Elizabeth, Cape Town, Durban, Salisbury, Krugersdorp, Pretoria.

I would like at this stage, Gentlemen, to draw your attention to the fact that Mr. Hallé, from Pietermaritzburg, did not wish his name to be submitted for re-election. I would like, on behalf of the Executive, and the Convention, to convey to Mr. Hallé the thanks of the Association for the splendid work he has done on the Executive Council and at Conventions as a whole. We are not actually going to lose all the services of Mr. Hallé for, although he has indicated that he would prefer not to serve on the Council, much to his surprise we have found some other work for him to do: Mr. Hallé, we thank you very much for the splendid work you have done for the Convention and the Association, and wish you the best of luck.

Mr. HALLE: Thank you, Mr. President and Gentlemen.

(Applause).

The next item is the Annual Report which I will now ask Mr. Taylor to submit.

## ANNUAL REPORT

March, 1953.

To the President and Members of the Association.

Gentlemen: I have the honour and pleasure of submitting to you the Annual Report, together with the Revenue and Expenditure Account and Balance Sheet for the financial year ended 28th February, 1953.

### Obituary

I regret to have to record the passing on of Mr. H. R. Bevington, an Associate and ex-Electrical Engineer, Middelburg, Cape Province.

### Twenty-Sixth Convention

The Twenty-Sixth Convention of the Association was held in Bulawayo from Monday 5th May, to Thursday, 8th May, 1952.

In all 278 members, delegates and visitors attended the Convention.

It is fitting at this stage to express the appreciation and sincere thanks of the President, members of the Association, delegates and visitors to His Worship the Mayor and City Council of Bulawayo for the most enjoyable entertainment provided especially for the ladies, for the facilities made available for holding our meetings and to those officials who assisted in making our stay in Bulawayo very pleasant indeed.

Our thanks and appreciation are also due to His Worship the Mayor and Councillors of Livingstone, on behalf of those delegates who were fortunate enough to be at the Victoria Falls on the 10th of May, for the hospitality extended to them, by way of visits to the Hydro-Electric Station, the Air Port, Rhodes Livingstone Museum and a Sundowner Party at the Boat Club on the Zambesi.

### Papers

Three papers were presented:—  
 "Rupturing Capacity of Switchgear and the Evaluation of Short Circuit Currents in an A.C. System" by Mr. E. L. Buchanan, Town Electrical Engineer, Louis Trichardt.  
 "The Development of the Bulawayo Electricity Undertaking" by Mr. R. H. Redman, Deputy City Electrical Engineer, Bulawayo.  
 "Proposed Compulsory Safety Specifications for Electrical Appliances" by Mr. J. W. Swardt, Principal Technical Officer, South African Bureau of Standards.

All these papers were well received and quite a good deal of discussion took place, the details of which are recorded in the 1952 Proceedings.

### 1953 Convention

An invitation received from the City Council of Johannesburg at the Bulawayo Convention in May, 1952, to hold the Twenty-Seventh Convention in that City was unanimously accepted.

### Membership

The following new members were elected during the period 1st March, 1952 and 28th February, 1953.

#### Council Members

Estcourt, Natal; Germiston and Kempton Park, Transvaal.

#### Engineer Members

R. V. Bailey, Town and Electrical Engineer, Edenvale.

P. Bechler, Electrical Engineer, Harri-smith.

L. Fitcher, Electrical Engineer, Kempton Park.

T. J. Millen, Electrical Engineer, Nigel.

E. de C. Pretorius, Electrical Engineer, Stellenbosch.

J. van der Spuy, Town Electrical Engineer, Odendaalsrus.

H. V. Ward, Electrical Engineer, Walmer.

A. H. Williams, Assistant Town Electrical Engineer, Springs.

#### Associate New Member

F. R. Waldron, Assistant Electrical Engineer, Umtata.

#### Transfer from Engineer Membership to Associate

N. Ferreira, Town Engineer, Coalbrook, O.F.S.

F. G. McDonald, Pietermaritzburg.

The comparative figures of membership for the years 1951/52 and 1952/53 are:—

	1951/52	1952/53
Council Members ...	100	103
Engineer Members ...	98	97
Honorary Members	5	5
Associates ... ..	35	37

### Financial

I regret to have to report that the financial year ended 28th February, 1953, showed a loss of approximately £55 as against a profit of approximately £267 in the previous year.

In view of the cost of printing having again been increased, it is expected that a

further announcement on this subject will be made after the Executive Council have considered the position.

I wish to take this opportunity of thanking the Council Members and Advertisers, on behalf of the Executive Council and Members, for their financial support and continued keen interest shown in the Association's welfare.

In conclusion my thanks is due to the President and Members of the Executive Council for the advice, assistance and courtesy at all times extended to me.

I remain,

Mr. President and Gentlemen,

Yours faithfully,

A. T. TAYLOR,

Secretary/Treasurer.

Mr. A. R. SIBSON (Bulawayo): Mr. President, it is with pleasure that I move the adoption of this Annual Report which represents the details of another year's work by the Association, by its Executive and by its Secretary.

The only item that calls for comment is the deficit of £55 during this current year, which was due, I think to some extent, to rather abnormal expenditure during the Convention last year; it was considerably higher than normal due to the Convention being held so far away from Johannesburg. Steps will be announced to you later regarding the method by which deficits will be avoided in the future; I think you can regard this as being well under the control of the Executive Council.

It, is, therefore, with much pleasure that I move the adoption of the Annual Report.

Mr. J. C. DOWNEY (Springs): I second that, Mr. President.

PRESIDENT: The adoption of the Annual Report and Financial Statement has been moved and seconded. Is it accepted by the members?

(Agreed).

PRESIDENT: I will now ask our Vice-President to take the Chair while I deliver my Presidential Address.

Mr. G. J. MULLER (Bloemfontein): Gentlemen, I now have much pleasure in calling upon Mr. Fraser, our new President, to deliver his Presidential Address.



## PRESIDENTIAL ADDRESS

By J. C. Fraser

M.I.Mech.E., M.I.E.E., M.(S.A.)I.E.

General Manager and Chief Engineer

Electricity Department City of Johannesburg

Mr. Chairman, Ladies and Gentlemen:

May I be allowed to repeat the thoughts I expressed yesterday morning when elected to the Presidential Chair. It is difficult to find words which would adequately express my thoughts at the honour of being elected President of the Association of Municipal Electricity Undertakings.

To follow in the footsteps of past Presidents is always a difficult task. They have all done meritorious service to South Africa and to our Association—to maintain the high standard they have set is no easy task. But I will endeavour with the able assistance of the members of the Executive Council, the ready advice and experience of the past Presidents and the co-operation of all concerned to do all in my power to advance the already remarkable progress of this Association.

I am also mindful of the tribute which this honour pays first to Johannesburg and second to the Electricity Department of which it is my privilege to be head. In looking for a suitable subject for my Presidential Address I could not resist the temptation to record some of the interesting facts in the phenomenal expansion which has taken place in the Johannesburg City Council's Electricity Department to provide cheap, abundant and reliable supply to its consumers.

In the short time at my disposal I propose to give as briefly as possible the story of the Johannesburg Electricity Undertaking from the end of the first world war until the present day. Many engineers who have been associated with electricity undertakings in this country over the past 20 years or so will recognize the familiar pattern of continuous expansion to meet ever increasing demand, and this account is perhaps no different to many others in this respect, but in a city of the size and importance of Johannesburg some facts and figures might be of general interest.

The generating capacity of the Undertaking which is now 270 MW is more than 18 times what it was in 1919, a phenomenal growth, due, not only to the

prosperity of the gold mining industry which has more than trebled the number of its consumers, but also to the increased use of electricity in homes, workshops and offices which has increased the consumption per consumer six fold.

I remember that in 1919 the total generating plant consisted of three Bellis and Morcom 3 MW turbo-alternators and a number of small reciprocating steam driven alternators and direct current generators. These machines were all installed in the old President Street station the building of which is still standing and houses a traction substation. At that time two further machines were on order and the first, a 3 MW Parsons turbo-alternator was installed in 1920. The other, a 6 MW machine by the same maker was installed two years later and brought the President Street Power Station to its maximum capacity of 22.3 MW. All this generating machinery has now of course disappeared, but it is interesting to note that at least one of the direct current motor converters in use in 1920 in this building is still giving good service today.

In 1923 a scheme was prepared for a new power station on the adjoining site in Jeppe Street. The project was delayed, however, by the newly formed Electricity Supply Commission whilst the merits of an alternative supply from their new station at Witbank were being considered. It was finally agreed that the Jeppe Street Station should be built but it was not until 1927 that the first 10 MW set was installed. By 1930 there were three 10 MW sets, and six 90,000 lbs. per hour water tube boilers in service.

The new station was now supplying power to a 3-phase distribution network at 6.6 kilovolts, and this necessitated certain changes in the centre of the city where hitherto the supply from the President Street Station had been 2-phase at 3 kilovolts together with a 480 volt D.C. supply. In the interests of economy a uniform supply was, of course, necessary, but there were many consumers in the city with installed machinery designed for 2-phase and D.C. supplies who could not be disconnected without hardship and it was eventually decided to continue their supply until the machinery was scrapped. The last 2-phase consumer was not disconnected until quite recently and there

are still a few isolated cases of D.C. consumers being supplied in the city area, mainly because they have D.C. lift installations.

In 1932 the Union of South Africa went off the Gold Standard and this heralded a period of unprecedented prosperity. New mines sprang up and the Witwatersrand spread over nearly twice its previous area. Johannesburg being the geographical centre of the gold bearing area was naturally the city most affected and passed through a "boom" period with more stability and permanence than anything previously experienced.

Closely linked with the prosperity of the city was the demand for electricity but the task of keeping pace with this demand was an almost impossible one. Forecasts made during 1931 for a ten year scheme of extensions were obsolete before 1934 and the actual peak load estimated for 1941 was passed during the winter of 1935. The scheme providing for an addition of 40 MW of new generating plant at the Jeppe Street station had to be completed in 3 years instead of 10 and further arrangements were made to proceed with another 40 MW extension to fully occupy the Jeppe Street site and to meet the 1938 demand.

At the beginning of this "boom" period a scheme had been introduced to enable consumers to borrow money from the Council to pay for electric installations. The consequent sharp increase in domestic load added to the Department's embarrassment, but, as a result of the increased consumption and the more efficient generation from the new station, the Council was able to make a substantial reduction in the Electricity Tariffs in 1936. These tariffs, which compared favourably with any in the Union, remained operative until July 1952 when the rising costs of labour and new equipment necessitated their increase by 10 per cent. It may be mentioned in passing that although the tariffs were increased by 10 per cent the cost of labour had doubled and the capital cost of equipment had increased three fold what it was in 1936.

The Jeppe Street station was renamed the City Generating Station in 1938. The final extensions to this station were completed in 1939 and the plant then consisted of two 25, two 18.75 and four 11 MW sets, with 14 boilers ranging from

60 to 135,000 lbs per hour each operating at a steam pressure of 365 lbs per sq. in. This position exists today except that the maximum continuous rating has been reduced from 131.5 to 120 MW by the removal of some of the obsolete wooden cooling towers.

The last two 25 MW alternators were designed to generate at 20 kV to feed a new bulk supply cable network linking up all the major suburban substations. Each of these 20 kV substations feeds its own 6.6 kV network. In order to restrict the magnitude of a fault reactors were interposed between the station and substations feeding the central area of the city near the station.

Meanwhile the question of future power station extensions was, as ever, under active consideration and the Council engaged the services of Merz and McLellan, Consultant Engineers, to report on a new power station at Orlando, 9 miles from the City. The report was approved in 1937 and orders were placed for two 30 MW turbo alternators, five 175,000 lb/hr. boilers, operating at 625 lb. per sq. in., and 825°F, with an option on a further 30 MW of plant. By 1939 the construction of the station was well under way but in view of the fast rising demand and the lengthy delivery periods required to obtain plant from overseas, it was decided to exercise the option and put in hand the first extension to Orlando consisting of a third 30 MW set, an additional boiler and auxiliary equipment—orders for these were placed on the 11th April, 1939.

The long threatened war which broke out in September 1939, considerably delayed the commissioning of the new station. The turbine casings and other parts of No. 1 turbo-alternator were lost at sea in the *Clan Stuart* and in order to enable commissioning of one generating set, similar parts were taken from No. 2 set, which was then in an advanced stage of manufacture, and the combined parts made up a complete set. This set was erected at Orlando as No. 2 set but owing to further shipping delays did not commence its trials until 23rd December 1941. By the middle of 1941 the second set had been completed in Britain but this time a whole shipment of parts was lost at sea. Manufacture of replacement parts was started at once but this second

machine could not be commissioned until October 1943 when it was designated No. 1 machine.

By 1940 the 2,500 kW house set was completed along with the whole of the transformer equipment for the first two 30 MW sets and four of the boilers. In the following year the first 88 kV transmission line between Orlando and John Ware substation in the City was completed. Power generated at 10.5 kilovolts at Orlando was stepped up to 88 kV for transmission to the City where it was stepped down to 20.5 kV for distribution.

In pursuance of an agreement between the Council and the Victoria Falls and Transvaal Power Co. Ltd., for reciprocal supplies of power, an 88 kV interconnector was erected between Orlando and V.F.P. system. This made possible an interchange of power up to 30 MW and this, together with an interchange of 17 MW via the existing City Generating Station interconnector, enabled the Council's peak load at 6 p.m. and also the V.F.P.'s peak at midday to be considerably relieved.

Further delays in the delivery of materials held up construction at Orlando although the Cleveland overhead transmission line was completed in 1942. In the following year most of the parts of No. 3 set were shipped to site. Once again, however, some of them were lost en route including, among other things, the alternator rotor and manufacture of this part was eventually so delayed that the third set was not commissioned until 1946, some seven years after ordering.

Those of you who are going to visit the Orlando Power Station will notice on a column close to Generator No. 3 a bronze plaque which has been erected by the Council as a tribute to the manufacturers and the British Merchant Navy.

The plaque reads as follows:-

#### ORLANDO POWER STATION

Erected for supplying power to the City of Johannesburg and for partial assistance to the Mining Industry when necessary.

No. 1 Set. Major turbine parts lost at sea in *S.S. Claw Stuart*. March, 1940. Further shipment of turbine parts and alternator rotor sunk in *S.S. Auditor*, July, 1941.

No. 2 Set. Erected and completed January, 1942.

No. 3 Set. Constructed from material under manufacture for No. 3 set, erected and completed October, 1943.

No. 3 Set. Erected and completed September, 1946.

Manufactured in Britain under unprecedented war conditions. Delivered to South Africa by the British Merchant Navy at the cost of considerable loss of lives of brave men.

"Undaunted they accomplish their task."

Before April 1943, the main difficulty of interchanging power between the V.F.P. and the Council's system was the fact that the Council's system was 50 cycles per second whereas that of the V.F.P. was 51½. This meant that the supplying system had to isolate a machine especially for the purpose. With the changing of the V.F.P. to 50 cycles per second in April 1943 a grid was formed which covered Pretoria and the whole of the Reef, linking up ten power stations.

When Mr. Rodwell, the previous General Manager, retired in 1944 and I took over the management I was indeed fortunate that the Department was in excellent shape to face the post-war demands in spite of the difficulties of the war years. It was already becoming apparent that the rate of increase of demand was returning to its pre-war level and that it was necessary to plan further extensions to the Orlando Power Station to meet the anticipated demand in 1950. Provision was therefore made for two more 30 MW turbo-alternators and four more 175,000 lb./hr. boilers.

Preliminary discussions were taking place at this stage with officials of the Electricity Supply Commission to decide the best means of meeting future power demands. It was agreed that Orlando Power Station be extended to its final capacity of 300 MW but it was also agreed that in ample time before the system became fully loaded a full investigation should be undertaken of the relative merits of purchasing supplies from an external source and of self-generation from a new municipal power station.

To keep in step with generation plans a long term distribution development scheme was being finalized in principle. It was proposed to divide the city into six geographical zones each to be individually fed from bulk 80 kV transmission initially from Orlando and augmented later from the E.S.C.—Rand Undertaking—formerly the V.F.P., via a new 80 kV substation on the City Deep Gold Mining property, and then later

from the proposed new power station. It was estimated that the new interconnections with the E.S.C. via City Deep would save considerable capital expenditure on generating plant which would otherwise be required to supply the evening peak demand, now to be supplied by the E.S.C.

Full measure of agreement on the construction of a new municipal power station was reached between the Council and the E.S.C. in 1948 and after various sites had been considered a piece of land approximately 2.75 miles north-west of Elandsfontein marshalling yard was selected as being most suitable. The Administrator approved the application in 1951 to proceed with the construction of this new power station at an estimated cost of £6,958,000 for the first portion of 90 MW and the station was to be named Kelvin Power Station after the famous British scientist of that name.

The regional 80 kV distribution scheme was now beginning to take shape. The first of the new 80 kV substations at Parkhurst serving the north western area, was put into commission when a 40 MW, 80/20.5 kV transformer was added to the existing 20 kV substation and the 88 kV transmission line from Orlando was made alive in April 1951. The Observatory 80 kV substation for the eastern area was commenced in February 1950, and shortly afterwards building was started at Wemmer near Rosettenville for the southern area. The Cydna 80 kV substation for the north-eastern section was commenced at about the same time. The 88 kV line from Orlando to Observatory via Cleveland was made alive at the end of 1951 and that from Orlando to Wemmer in March 1952.

Returning to the generating side, the erection of Nos 4 and 5 generators at Orlando was behind schedule due to late shipments from overseas. No. 4 was however, put into commercial service in April 1951, in time for the winter peak load and No. 5 was ready for service in February 1952. By July 1952, the station had reached the half-way mark, namely five 30 MW sets and 10 boilers. Today, all equipment and buildings for extending the Orlando Power Station by an additional 150 MW have been ordered at a total tender price of £6,922,081. Two

cooling towers, each 307 feet high, are being erected and it is hoped that the first turbine and two boilers will be commissioned towards the end of this year (1953). Completion of this extension which is scheduled for 1955/56 will bring the total installed capacity of Orlando Power Station to 300 MW.

The first portion of the Kelvin Power Station will consist of three 30 MW turbo-alternators and six 187,500 lbs./hr. boilers operating at 625 lbs./sq. inch pressure and 865 degrees Fahrenheit. The second portion will be a further 90 MW plant which will complete what will be known as the "A" station. The other half of the project, the "B" station, has not yet been designed. The question of certain innovations such as larger alternators and pulverized fuel firing for the boilers is under consideration.

The trend of increasing capital cost of generating equipment since 1938 is well known to all of you, in the case of Johannesburg the following figures may be of interest:-

The City Generating Station with its 131 MW installed capacity, completed in 1939, cost £13.2 per kW. The initial 90 MW portion of Orlando, completed in 1942/46, cost £26.1 per kW. The 60 MW extension to Orlando completed in 1951/52 cost £42.1 per kW. The final extension to Orlando of 150 MW, now in course of construction, was estimated in 1948 to cost approximately £48 per kW, but with the increase in cost of material and labour, which has taken place since that date, the whole of which is for purchasers account, the final cost will possibly be not less than £54 per kW. The estimated cost of the initial 90 MW portion of the new Kelvin Power Station is approximately £7,000,000 or £78 per kW, but there is every possibility that this figure will be exceeded due to rising costs.

Regarding the future requirements for power in Johannesburg, there are no signs, as yet, of any abatement in the rate of growth of the demands, and our forecast of requirements up to 1965 are based on the known factors which have contributed to this growth over the past 26 years. The difficulty today in planning for the future is the long periods which elapse between the date when decisions

have to be taken to prepare for and order additional plant, and the date when such plant is ready for service, in our case it is found that this period is approximately  $6\frac{1}{2}$  years.

When speculating upon the more distant future one cannot ignore the growing possibility that atomic energy will one day play a big part in power production in this country. Uranium is obtained as a by-product of the gold mining industry and occasional references in the press serve to remind us that the atomic age is already here although we have little evidence of it except an occasional press report of a mighty bomb explosion.

Interest in the application of atomic energy to power production, which was greatly stimulated by optimistic announcements of a few years ago, has tended to flag somewhat because of the secrecy which has to be observed and the, now, much more cautious official view of progress.

It is, however, known that atomic energy is used for heating at the Harwell Research establishment and for generation of power on a small scale at Idaho in the U.S.A. More recently reports have been issued by the U.S. Atomic Energy Commission on an experimental plant with a capacity of 150 kWa operating at the national laboratory at Oak Ridge.

It has been suggested by Sir John Cockcroft that, taking into account plutonium production, up to 1 per cent of the total uranium in a natural uranium reactor might be used and that at 1 per cent utilization natural uranium has a calorific value about 30,000 times greater than coal. On this basis it is interesting to note that to supply the annual requirements of electricity for Johannesburg — say 1,000-million Kwh at 25% overall thermal efficiency—it would require approximately 18 tons of natural uranium per annum as against 500,000 tons of coal.

The market price for uranium ore outside of S.A., is said to be, about £4,000 per ton of uranium content. On the preceding basis this is equivalent to less than 0.02 pence per Kwh which is practically negligible. The station plant which would be used in conjunction with a reactor may be expected to cost slightly less than that of an ordinary station since fuel and

ash handling facilities would not be required. Assuming that an atomic station is to compete with a S.A. coal fired power station such as Kelvin, all costs of constructing the Station, extracting uranium and setting up of the operating reactor should not exceed say, £100 per kW developed, taking into account the capitalized value of the coal saved.

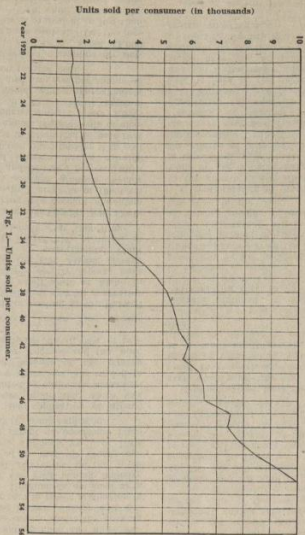
The Idaho reactor previously mentioned produces 100 kW and its initial cost was £10,700 per kW whereas the Oak Ridge equipment, incorporating what is reported to be "an important milestone, in the search for economical atom generated power," is said to have cost £382,700 plus £1,000,000 for research and development, i.e. £9,200 per kW.

It would appear from these figures that even when neglecting the million pounds spent on research and development there is still a considerable amount of leeway to be made up before the atomic power station can become an economic proposition.

Finally, we look forward with considerable interest to the future. In Johannesburg there is no sign of saturation being reached as yet, and expansion is expected to continue for many more years, but, we are confident that with continued assistance from the E.S.C. at evening peak periods the Johannesburg electricity undertaking will be able to meet all future demands at least as well as it has done in the past.

A recapitulation of statistics in regard to the growth of the Electricity Department of the Johannesburg City Council is insufficient without due recognition of the efforts of personnel responsible for such growth. To the City Council appreciation is expressed for its sympathetic treatment of matters concerning the department (all sections — staff, daily paid, Europeans and Non-Europeans) tribute is paid to the enthusiasm, loyalty and toil (often under adverse conditions) which have enabled the department to maintain its position as a valuable asset to the City Council and a credit to electricity undertakings.

Appended are the following graphs: Fig. 1—Units sold per consumer; Fig. 2—(a) Number of consumers, (b) units sold, (c) maximum demand; Fig. 3—average revenue per unit from private consumers.



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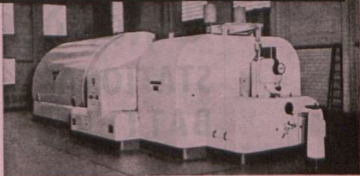
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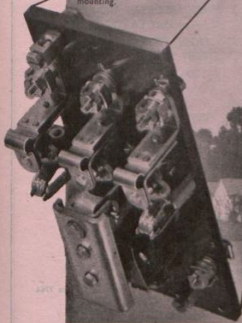
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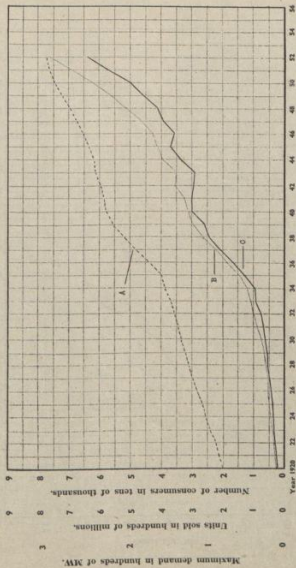


Fig. 2.—A: No. of consumers. B: Units sold. C: Maximum demand.

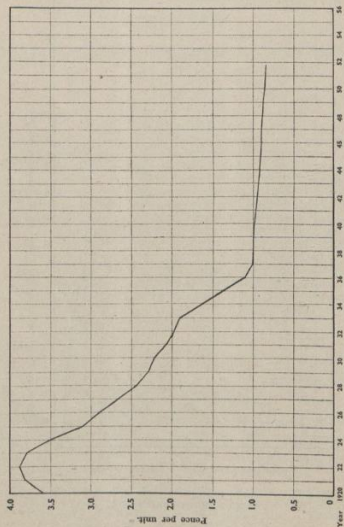


Fig. 3.—Average revenue per unit from private consumers.

Mr. MULLER: Thank you, Mr. Fraser. It is not my duty to discuss your paper, but I would like to say that it does reflect credit on the vision of your Department and the courage of your City Council that you can present to us such a strong position in your Address.

I will now call upon Mr. Bradley to propose the vote of thanks.

Mr. D. A. BRADLEY (Port Elizabeth): Mr. President, Mr. Vice-President, Gentlemen: It is more than a privilege to me, it is a favour, that I should be allowed to have a word on this excellent Presidential Address given to us this morning.

Some of you know of the early days mentioned in this paper. Actually, I think I joined the Johannesburg Municipal service some three or four months after Mr. Fraser. So that many of the recorded incidents and positions of the Department, between the years 1920 and 1935, I knew about, for Mr. Fraser, our President, with me, as men much lower down the scale than we are today, have walked the streets of Johannesburg, in our respective jobs, for the Department's general benefit; I say "benefit", because we have both been workers; we did work in those days, believe it or not—(Laughter). Therefore, my favour today is, shall I say, because I was probably a colleague in overalls as was our worthy President.

He has given us much food for thought in his concluding paragraphs, where he talks of atomic energy possibilities; and the thought occurred to me then, "I wonder how many of our present assembly will see atomic energy an economic commercial proposition to supplant our present, indeed good, mode of generation through steam and coal?" Many of us will not; but I venture to suggest, there are some who will recall, probably this very morning, the fact that our new or advanced stage of the means of production of electrical energy, now the nerve centre of our life, will be undertaken much more economically and perhaps without so much bother to the individual Engineer.

We all have our power troubles. Mr. Fraser has had and still has them and probably will have them until the end of his time, and so will those succeeding him; we will all have difficulty in providing

adequate supplies to meet the demands for this great essential nerve power, or nerve energy.

It is, Sir, with great gratitude that I thank you, on behalf of this Association for this delightful paper; historical indeed because, when you and I worked together, extending cable networks and overhead mains, and so on, new buildings were then being erected which we thought would satisfy two generations, anyway. This morning, walking with my good friend from Cape Town up the main street, I did not think there were so many old buildings in Johannesburg that needed replacement. Eloff Street is being rebuilt and other and adjoining streets are being rebuilt now; it is just too amazing to know that the growth of this wonderful City is such that even the business world, never mind the housing problem, cannot find adequate space in which to build offices and house their staffs.

Sir, my personal appreciation to you and, on behalf of this Association, many thanks for your able address; and we offer to you our best wishes for a most successful and happy year of office as President of this Association.

Mr. G. J. MULLER: May I now call upon Councillor Richardson to second the vote of thanks?

Councillor L. RICHARDSON (Durban): Mr. President, Mr. Vice-President and Gentlemen: As a mere City Councillor and not a technical man, I have very much pleasure in seconding the vote of thanks so ably proposed by Mr. Bradley.

Councillors and Engineers have been very interested in the growth of the electricity supply over the last 30 years in Johannesburg as described in the paper. I am sure that Mr. Fraser has played no little part in that development because prior to his appointment as General Manager of the Department in 1944, he had already served the Department for many years and as an Assistant has contributed to the building up of the Department.

At the beginning of the century, electricity was generally looked upon as a luxury but it has now become one of the main essentials of modern civilisation. It is remarkable to note that despite the high rate of development in the past, saturation is not yet even in sight; despite increasing costs, higher

efficiency and increased turnover have enabled the service to be rendered to the community at a remarkable low cost.

I now wish to refer to three particular points in Mr. Fraser's paper.

The delay which elapses between the granting of the Council authority to instal Power Station machinery and date when it is eventually installed, appears to be as long as 6½ years. No wonder City Councillors feel some anxiety for the future when they realise how far ahead planning must be done.

Then Mr. Fraser referred to the possibilities of uranium; I am wondering what the future holds in store in this matter? Will the time come when one will buy a new motor car provided with sufficient atomic energy to propel the car for 100,000 miles? In fact, I wonder if it will come about that we will buy a motor car and say to it "take me to Eloff Street" and it will. I want to stress that in saying this I am speaking only as a layman.

Mr. Fraser then said, "the Johannesburg Electricity Department will be able to meet all future demands at least as well as it has done in the past." What more is required of a good Engineer than that he should so plan for his Council that he will be able to provide all the Electricity which might be demanded by that City?

Finally, I associate myself with Mr. Bradley in wishing you, Mr. Fraser, the very best in the coming year and we hope that you will have a very happy year of office. (*Loud Applause*).

(On resuming at 11.15 a.m.)

PRESIDENT: It now affords me great pleasure, Gentlemen, to call upon Mr. Pulik, the Technical Engineer of the Electricity Department, Johannesburg, to present his paper on the:—

### BASIC PRINCIPLES OF THE CONSTRUCTION OF ELECTRICITY TARIFFS

By

G. PULIK, Dipl. Ing., A.M.I.E.E.,  
A.M.(S.A.)I.E.E.

(Johannesburg Electricity Department)

#### 1.0 Introduction

The subject of tariffs is now more than ever of particular interest to those concerned with Electricity Supply. The avalanche of post-war inflation has affected

this business like any other, though technological advances, improved load factors and utilization factors coupled with the fact that the majority of plant now in commission has been purchased at pre-war prices, have tended to limit the effects of inflated labour and material cost on the prices charged for electrical energy, on the average to increases not exceeding 20%.

However, as the old plant becomes obsolete and is replaced, and as existing capacity is augmented at today's prices, so will electricity undertakings be faced with the necessity for consecutive increases, until the total increase of price levels as compared with pre-war conditions is eventually reflected in a comparable increase in the cost of electricity to the consumer. This means that the price of the unit will eventually be not far from double the 1939 price.

The local authorities will be faced with the unenviable task of distributing this burden among their consumers. That this should be effected as equitably as possible will not only be the desire of those responsible for framing new tariffs, but will also be demanded by the general public. This in turn necessitates an analytical approach to the problem and the ability to demonstrate that any proposed new tariff structure is based on sound reasoning and a rational method.

The purpose of this paper is to point out some of the technical problems involved in the framing of tariffs and to issue an invitation to those interested to give this problem thought and to contribute towards the development of methods of analysis. To be more explicit, it seems to me the time is ripe for the A.M.E.U. to form a working committee, to examine and make recommendations on forms of tariffs, methods of fixing price-levels in relation to an undertaking's economy, to institute and encourage a research programme for the purpose of collecting and analysing basic data and ultimately to encourage a unification of tariff forms throughout the Union of South Africa, such as has taken place in the United Kingdom over the last twenty years. The potential scope of such a committee is wide and its potential usefulness beyond question.

## 2.0 The basic requirements of a tariff structure

The basic requirements of a sound tariff structure can briefly be stated as follows: -

The first requirement is that the tariff should at least cover costs and, if possible, produce a profit. This point needs stressing. It is not sufficient that the total revenue should exceed the expenditure at some given time, but it is also necessary that a tariff once promulgated should at least during times of reasonable economic stability keep on producing profits irrespective of the manner in which the load curve of the undertaking changes in the course of years. In fact this is the acid test of the basic soundness of a tariff structure. This can only be achieved if the tariff does not include sub-economic charges, as can easily happen when the mechanism of electricity supply economics is not fully appreciated. As a particularly glaring example, care should be taken not to include a unit charge, which is lower than the cost of fuel burnt at the power station, a by no means hypothetical case, particularly in these days of rapidly advancing fuel and transport costs.

The second requirement is that a tariff should be equitable. This means in general that the charges should be related to the cost of supply as far as practicable and, in the words of the British Electricity Act, that there should be "no discrimination between consumers similarly situated."

The detailed discussion of this boldly stated principle will follow.

Further requirements sometimes conflicting with the principle of equity are: -

The unproductive costs of metering and administration must be kept to a minimum.

A tariff must be easily understood by the consumers, who generally are not familiar with such concepts as "demand."

Custom and local preferences must be taken into account.

To quote Mr. R. V. Saunders the form of tariff offered must be "a compromise between the costs of supply to the class of consumer, the costs of actually recovering these costs and the preference of the consumer as to the method by which the costs of supply were collected from him."

## 3.0 Electricity profits

This may be an opportune moment to digress a little on the question of profits from municipal electricity undertakings.

It is not intended to rake up here the time-worn argument whether or not the local authorities are or are not entitled to a profit on the grounds that the ratepayer guarantees the loan-moneys invested in the electricity undertaking, or on the grounds that electricity tariffs should in all equity be used as a supplementary rating instrument to spread the burden of the ratepayer more equitably among the citizens.

Accepting that some contribution in aid of rates must be made I would make submissions on the following points: -

The contribution to rates should be a well defined one either in relation to capital invested, or as a percentage of the annual turnover. Any balance of profits remaining should be retained by the undertaking. Electricity supply undertakings must from time to time expend capital monies on new or additional plant. These additions cannot be made in sufficiently small increments so that these are comparable with the annual increase in loading, but it is usually more economical in the long run and in many cases inevitable to make additions of sufficient magnitude to provide for load increases a few years ahead. Thus an undertaking may get into temporary difficulties until the load, and therefore, the revenue, have increased sufficiently to catch up with the additional capital charges incurred in respect of the newly installed plant. One way to get over this difficult period would be to increase tariffs, a course which in subsequent years may well be found to be unjustified. Another would be to form a reserve out of "surplus" profits, which would allow the undertaking to meet its obligations during any difficult period of heavy capital charges arising from new plant and which can be replenished in times when profits again re-appear.

It is this latter expedient, which has been adopted by the Johannesburg City Council, when in 1950 the Electricity Tariffs Stabilization Fund was established. Briefly the Electricity Department's annual contribution to the rate fund, which used to absorb all the electricity profits, is now fixed at 2% of the capital outlay from Council's loan funds. Any

monies available, after the contribution to the rate fund has been met, are put aside in the Electricity Tariffs Stabilization Fund. Should at any time the revenue from electricity supply be insufficient to meet the required amount, the short fall will be drawn from this reserve. This arrangement will not only help the department over any difficulties of a temporary nature, but will also help unavoidable adjustments to tariffs to be made at a later date, and in smaller steps, than may have been necessary otherwise, and facilitates the balancing of the municipal budget as a whole, as the department's contribution is calculable in advance.

Unfortunately this fund was established too late to avoid an increase of 10% in Electricity Tariffs in Johannesburg as from July 1951.

Another use such surplus profits could be put to is for "ploughing back" that is for the purchase of assets, which would be free of interest charges, thus safeguarding the undertaking from the vicissitudes of economic depressions, when both the electricity consumer and the municipal treasury may find it difficult to contribute additional funds to keep the undertaking solvent. It is often argued against this proposal that in municipal finance today's generation of consumers should not be made to pay for benefits which would accrue to the next one, but each generation should be made to pay its own way. This is obviously a fallacy. Each generation must and does provide at least in part for the next, and today's accumulated wealth could never be produced by a single generation's unaided effort.

The other point I would submit for consideration is that all monies which are contributed to General Council funds should in the annual accounts be made to appear as profits. This is by no means always the case. Arbitrarily fixed un-economic prices for current supplied to other municipal departments are by no means uncommon. Similarly services rendered by other departments to an electricity undertaking are often overvalued, in order to assist some non-productive department.

The illogicality of some financial regulations is sometimes to blame for "hidden" contributions to Council's general funds. Thus a recent ordinance in the Transvaal,

to regulate the handling of loan funds provides that the proceeds of the sale of obsolete material should be credited directly to a general fund after having been originally paid for by the electricity consumer, thus in effect constituting a deferred levy on electricity profits. In private enterprise under the company laws this sort of transaction would be illegal. In municipal finance this can lead to a false representation of the financial standing of an electricity supply undertaking resulting in times of stress in remedial action being taken in the wrong direction to the detriment of a local authority as a whole.

#### 4.0 Equity between consumers

It has been stated earlier that equity between consumers meant that the consumer's bill should be related to the cost of supply on the one hand, and that discrimination between consumers similarly situated should be avoided.

Relating the account to the cost of supply does of course not mean that the supply to each consumer should be costed. It only means that a consumer's account should be related to some measurable characteristics, which affect the cost of supply in a known manner. These characteristics are: -

The number of units consumed, which govern the amount of fuel burnt and certain other costs at the power station, and the demand, and its timing in relation to the peak demand on the system, which affects the amount of plant installed on this system.

Factors over which a consumer has no control should, unless they affect all consumers equally, not be allowed to affect the individual electricity account.

As an illustrative example the well established principle that a consumer's monthly bill should not be affected by his situation in relation to a substation may be mentioned. The decision of locating a substation at a particular site is made on considerations of overall economy and is entirely fortuitous from the consumer's point of view.

As another example of a similar factor outside a consumer's control, the practice of relating a tariff-scale to a particular voltage of supply may be mentioned. The decision whether a consumer is to be supplied from the low tension or the high



tension mains should be made entirely on the basis of overall economy, and should not affect the price paid by the consumer. The principle should be that the consumer's bill is entirely decided by the use he makes of electricity, i.e., by his demand and the number of units consumed, and not by the arrangements made by the supply authority to supply him.

Similarly factors entirely extraneous to electricity supply should not affect the price paid for electricity. It has become an established practice in municipal electrical undertakings in this country to discriminate against a group commonly designated as business consumers. Such discrimination has no justification from the point of view of electricity supply economics, but arises, I suspect, from a feeling that the business man is best able to pay, and should, therefore, be made to contribute heaviest to the relief of rates. In fact, however, as a group, the business consumers are probably our best customers. They contribute comparatively little to the evening peak and they have the best group-load factor. It is probable that municipal undertakings could benefit considerably by offering a judiciously arranged promotional tariff of this type of consumer.

On the other hand some municipalities offer subeconomic tariffs to industrial consumers to attract industry in their area. Quite apart from the doubts whether such a measure is in effect a contributing factor to the desired result, in view of the almost negligible proportion of the total turnover which expenditure on electricity constitutes in the case of secondary industries, such a procedure is definitely discriminatory and is to be condemned on the grounds of equity.

### 5.0 The costing of electricity supply

Some method of allocating costs to consumers is necessary not only in order to relate the consumer's account to the use he makes of electricity for the sake of equity, but also because it enables the management to decide where and in approximately what proportions profits or losses are made in an undertaking.

### 5.1 Analysis into energy, demand, consumer and establishment costs

That the costs of electricity supply vary (1) in proportion to units sold, and (2) in proportion to demand, has been

recognized very early in the history of electricity supply. In addition it can be demonstrated that certain costs vary in proportion to the number of consumers served, and other costs remain unaffected by any of these factors.

This is in accordance with the generally accepted view that the costs of any business concern can be analyzed into variable, semi-variable and fixed costs.

Energy costs are those costs that vary in proportion to units sold. This comprises the cost of fuel and water used and that proportion of maintenance costs at the power station which depends on the running time of the plant, and in practice is sufficiently closely approximated by the cost of maintenance in the boilerhouse.

Demand costs include all operating and maintenance costs at the power station not included in energy costs, as well as the capital charges on power station plant. In addition capital charges, operating and maintenance costs on transmission and H.V. distribution equipment must be added.

Consumer costs include the cost of metering, billing and other consumer services, such as a breakdown repair service as well as the capital charges and running costs of a hypothetical network of zero capacity, though in practice the actual costs of the low tension network may be included as a sufficient approximation.

Distribution costs are a complicated function of the number of consumers served, the consumer density, and the after diversity maximum demand. The effect of these factors is difficult to separate, but as an approximation and disregarding the effects of consumer density, that part of the distribution costs, which varies in proportion to the number of consumers is the cost of a network of zero capacity, i.e. including all equipment such as poles, transformer houses, cables, etc., but excluding the cost of copper, while the cost of copper and transformers on the system may be regarded as varying as a function of demand. However, as a further approximation it is convenient to include the whole cost of the low tension network in consumer costs and the whole cost of the high tension network in demand costs.

Fixed costs or Establishment costs as they will be called in this paper need

no further explanation, and are practically synonymous with what the Municipal Accountant calls "Management costs."

To put this in a slightly different and plainer way: The establishment costs are incurred the moment an undertaking opens its doors and before any consumers are connected. Consumer costs are incurred in proportion to customers provided with an electrical connection and before any current is supplied.

Demand costs are incurred in proportion to the number and size of appliances put into use by the consumers.

Finally energy costs are proportional to the number of units sold, or—to put it differently, to the use the consumers make of their appliances.

Table I shows an actual analysis of supply costs in the Johannesburg Electricity Department made a few years ago. An examination of this table will reveal an important characteristic of electricity supply economics, which contrasts greatly with conditions in industry in general. That is the low proportion of variable (energy) costs to the total annual costs of the undertaking. These amount to only about 20% as compared with about 80% or more in an average manufacturing concern.

It is this fact which explains the desirability of encouraging unit sales if this can be accomplished without at the same time increasing the maximum demand on the system.

### 5.2 Classification of consumers

Having analyzed the total costs of an undertaking under the appropriate headings, the next problem is to allocate these costs to consumers.

This is best done by grouping\* consumers under broad headings in accordance with their general characteristics, particularly in accordance with the timing of their maximum demand and the general shape of their load curve.

In purely urban areas this classification is traditionally made under the headings:—

- (1) Residential consumers.
- (2) Industrial consumers.
- (3) Business consumers.

Figures 1, 2, 3 and 4 give an illustration of the typical load curves for these groups of consumers.

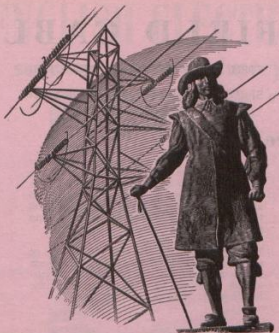
The most homogeneous of these groups is probably the group of residential consumers. They consist fairly uniformly of essentially similar family dwelling units with basically the same load curve and similar relationship between installed capacity, maximum demand and units consumed. This arises from the fact that the majority of people switch their lights on and off at about the same time, cook their meals at the same time and generally exhibit similarities in habits within one and the same community.

Industrial consumers are less sharply defined. The main factor they have in common are the working hours, and due to the fact that motors represent a large

TABLE I.  
ANALYSIS OF ELECTRICITY SUPPLY COSTS

Johannesburg Electricity Department—Financial Year 1947/48

Cost Classification	Amount	% of Total	Average
Energy Costs ... ..	£336,000	21.4	0.154d. per unit sold.
Demand Costs:			
Generation ... ..	£437,000	27.9	£2.18 per kW M.D.
Distribution ... ..	£318,000	20.3	£1.59 per kVA M.D.
Consumer Costs ... ..	£324,000	20.6	£4.70 per consumer p.a.
Establishment Costs ... ..	£153,000	9.8	
Total ... ..	£1,568,000	100.0	0.72 per unit sold



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proportion of their current consuming appliances, their power factor is relatively low. Their load curve may vary from the peakiness of an arc welder to an absolute constancy throughout the 24 hours. Nor is it easy to relate demand to their installed capacity. Such relationship I suspect is extremely variable and deserves to be made the subject of a special study.

In addition it is often difficult to draw a line between Industrial and Business consumers. Thus a motor mechanic's workshop, it may be equally successfully argued, could be classed as either.

The business consumers are the least homogeneous group. They may include anything from a warehouse illuminated with a single 60 watt lamp to a jeweller shop with an illumination of 50 or more footcandles; from a tea-room with lights burning 18 hours a day 7 days a week to a city office, which puts on its lights only when thunder clouds obscure the sky.

### 5.3 Allocation of cost to groups of consumers

Having established some sort of grouping for the consumers on the basis of some common characteristic affecting the cost of supply, the next step would be to allocate the total costs of an electricity undertaking to the established classes of consumers.

Energy costs are allocated simply in proportion to units sold to each class of consumer. Under special circumstances a certain amount of differentiation may have to be introduced. Thus if an undertaking is fed from two or more stations with different thermal efficiencies, and therefore, different incremental costs per unit, a bulk supply given to another undertaking may under certain circumstances be considered as coming from the station with the higher incremental costs, and the energy costs to such a bulk supply should, therefore, be debited with correspondingly higher energy costs.

Consumer costs are allocated to groups of consumers in proportion to their numbers. Here again a certain amount of differentiation is possible, if data are available, to allow for instance for differences in metering costs between demand metering and straight kWhr metering.

The allocation of demand costs presents the greatest difficulties. The problem is in many ways a similar one as is encountered in other spheres of industry, where several by-products arise from one process. As an example a gas-works produces both coke and gas, and depending on which commodity is in greater supply the other commodity is regarded as a by-product. The cost allocation between these two commodities and, therefore, the price will be governed by the demand for them, the ideal being to adjust the price so that the whole output of both will find a market.

In a similar way, though of course the parallel does not apply in every respect, the demand of electricity at different periods of the load cycle may be regarded as different products, the main products being the peak supply, which governs the amount of plant installed, the by-products being supplied during the off peak period.

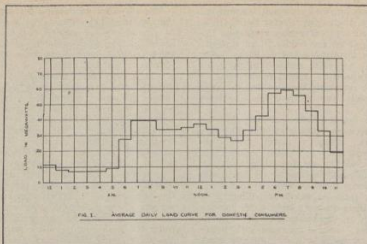
It is in this reasoning that the justification for charging the bare energy cost for off-peak supplies lies, and also the allocation of demand costs in the basis of peak responsibility.

However, with todays ever increasing day loads, this narrow concept of peak responsibility does not serve any longer. Day loads are now approaching and in some cases even exceeding evening peaks. It now becomes necessary to widen the concept of the peak period to include potential peak periods, and to consider only those periods as off-peak, which have no prospect in the foreseeable future of becoming peak periods.

A great deal of research on allocation of demand costs has been conducted in Great Britain, and the results of this research have been summarised in a Technical Report K/T 109 of the British Electrical and Allied Industries Research Association entitled:- "An Improved Method for Allocating to Classes of Consumers The Demand-related Portion of the Standing Costs of Electricity Supply."

This report deals in detail with the various methods in use from time to time, and puts forward a new method, which briefly, takes into account the group demand within the potential peak period, and the load factors within this period.

This method is the most authoritative available today, and gives a reasonable distribution of costs which can not only



serve as a basis for tariffs, but also gives a relative value of various types of consumers, which may serve as a guide to policy. It can also give the relative value of various types of load. For instance, from calculations made in the Johannesburg Electricity Department, it would appear that units supplied to the electric radiator load, cost about 1½d. to produce. Approximate cost of cooker load could also be calculated, but unfortunately, sufficient data for this calculation are as yet not available.

It will be noted that the E.R.A. method allocates demand on the basis of consumer's group characteristics, as illustrated in the examples of load curves in Figures 1 to 4, rather than on the basis of consumer's individual load curves.

This is because:-

- (a) It is the after diversity demand, which determines the demand costs of an undertaking rather than the individual demand of the consumer.
- (b) Because the allocation of demand costs on the basis of group load curves makes it possible to take into account the timing of the after diversity maximum demand in relation to the system peak.

One method of obtaining the load curves for groups of consumers is described in a paper by P. Schiller, "An analysis of the

load on a Modern Electricity Supply System" Journal I.E.E. 1944, 91, Part II, p. 433.

Table II gives the results of a demand cost allocation attempted in the Johannesburg Electricity Department. The figures in this allocation are, however, not to be taken as representative, as due to a special set of circumstances, a bias in favour of certain consumer groups was allowed in the calculation.

Having allocated energy, consumer and demand costs, it remains to allocate establishment costs and to add an amount to produce the required "profit."

This allocation may be made on a percentage basis, though a certain latitude could be exercised to give expression to policy such as the encouragement of a certain type of consumer in order for instance to increase the system load factor and thus to improve the utilization of plant and mains.

The result of an attempted cost allocation is given in Table II.

Though a high degree of accuracy is not claimed for this briefly sketched method of costing electricity supplies, and a lot of work could and should be done to improve these methods, I submit that it gives at least an order of magnitude of the cost of supplying a defined group of consumers and gives a rational basis for the formulation of a price policy, which constitutes a vast improvement on the use of rough





FIG. III. AVERAGE DAILY LOAD CURVE FOR INDUSTRIAL CONSUMERS.

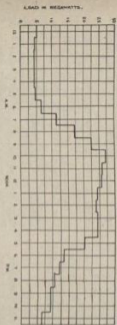


FIG. II. AVERAGE DAILY LOAD CURVE FOR BUSINESS CONSUMERS.

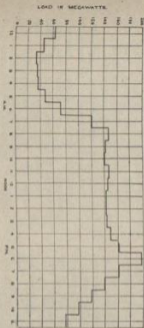


FIG. I. AVERAGE DAILY SYSTEM LOAD CURVE.

TABLE II.  
ALLOCATION OF COSTS TO CLASSES OF CONSUMERS

Class of Consumer	Energy Costs		Demand Costs			Consumer Costs		Establishment Costs	Total Cost Average Per Unit Sold
	Amount	Average d./Unit	Amount	Group M.D.	Average £/k.W.	Average	Av. per Consumer		
Residential ...	£178,000	·154d.	£411,000	113 M.W.	£3·63	£290,000	£4·7	£92,000	·85d.
Business ...	£49,000	·154d.	£110,000	28 M.W.	£3·93	£24,000	£4·7	£19,000	·64d.
Industrial ...	£67,000	·154d.	£161,000	40 M.W.	£4·02	£10,000	£4·7	£25,000	·58d.

averages, unsupported individual intuition and considerations unrelated to the economics of the undertaking concerned.

### 6.0 Tariff forms

The most popular forms of tariffs at the present time are: -

- (1) Fixed block tariffs, i.e. tariffs which charge a high price for an initial block of a fixed number of units, followed by one or more blocks of lower priced units and a follow on rate.
- (2) Variable block tariffs, i.e. tariffs whose initial block of high priced units is varied according to some characteristic of the consumer, such as installed capacity or number of rooms.
- (3) Two-part tariffs, i.e. tariffs consisting of a variable service charge and a single follow on rate or a block of higher priced units and a follow on rate.
- (4) Maximum demand tariffs, with or without a service charge.

It is convenient at this stage to discuss the various forms of tariffs in relation to the groups of consumers, to which they are applicable.

### 6.1 Residential tariffs

Starting with the domestic consumer, it will be at once apparent that any form of demand tariff is not practicable, principally because there is still no demand meter available at a price comparable with that of the standard single-phase kWhr meter.

It is also doubtful whether a demand tariff would be acceptable to consumers, who may find it difficult to understand how it works. A flat rate, i.e. a single price for all units would be impracticable, because it would be too low in the case of consumers, who use lighting only, as it would not recover the consumer costs and demand costs due to a comparatively low consumption. On the other hand it would be too high to encourage the use of appliances which, due to comparatively long hour use, are a desirable load.

The block tariff with a fixed initial block of higher priced units, and a two part tariff with a fixed service charge, has similar disadvantages. Though it enables the undertaking to recover its fixed costs to a certain extent irrespective of consumption, the fixed initial block or

service charge will prove too high for a large number of smaller but not necessarily unprofitable consumers on the one hand and too low for the consumer with a large lighting load and no appliances on the other.

I would submit, that the ideal tariffs to strive for should aim to recover the fixed and a part of the demand cost in proportion to the lighting load of a consumer, and the remaining demand cost should be allowed for in the follow up rate. This is in accordance with the economic principle, that fixed costs should be recovered on a commodity which sells without effort almost at any price, and that marginal cost plus a small profit should be charged for the "marginal" requirements of the consumer, or in other words for the commodity, the sale of which needs encouragement. The assessment of the lighting load, however, presents some difficulty. The most popular methods are to assess the initial charge either on the basis of municipal valuation of a property, the floor area of the house or the number of rooms in the dwelling. The first is probably the least desirable, as it introduces considerations entirely foreign to the business of electricity supply, and requires re-adjustment every time the valuation roll is revised. Of the two others the room basis is the most popular, though both methods have their disadvantages, and can be at best regarded as rough approximations. However this may be, the fact that such assessments are but rough guides to demand, is no argument to dispense with them altogether, for they have a rational justification and some attempt at equity is better than none. This has been widely recognized in Great Britain, and the following quotation from the report of a Royal Commission is pertinent: -

"As it is not commercially practicable for the Supply Authority to ascertain the effective demand of each domestic consumer (i.e., by taking into consideration the nature, extent and period of his uses of electricity) the only course open to the Supply Authority in order to arrive at an equitable fixed charge, is to divide the proportion of the standing charges due from the whole body of domestic consumers on the multi-part tariff according to some reasonable basis."

BRITISH ELECTRICITY AUTHORITY  
BOARD'S STANDARD DOMESTIC TARIFFS

Board	Primary units (p.u.) and rate	Secondary Units	Excess Units	Prepayment Supplies
Southern .. .. .	40 units up to 4 rooms + 10 per room extra at 5d.	—	1d.	First 40 units at 6d.
South Western .. .. .	(a) 40 units up to 4 rooms (b) 60 for 5-8 rooms and (c) 90 over at 5d.	For (a) next 40 (b) = 60 (c) = 90 at 2d.	1d.	First 60 p.u. at 5d.
Eastern .. .. .	Two-part, 15/2d. p.u. first 1,200 sq. ft. floor area; next 3,600 sq. ft., 4.4d. per 400 sq. ft.; over free. Alternative tariff: First 104 units at 6d.	1d. Next 1,040 at 1½d.	— 1d.	+ 3d. per week for first 1,200 sq. ft. Primary units at 6½d.
East Midlands .. .. .	30 units for 3 rooms + 9 units per room extra at 4d.	—	1d.	(no extras)
Midlands .. .. .	12 units per room (minimum 36) — at 4d.	—	1d.	Primary units at 5d.
South Wales <sup>0</sup> .. .. .	10 units per room* up to 10, then 5 per room — at 5d.	—	0.85d.	(no extras)
Merseyside and North Wales	12 units per room* up to 10, + 8 per room extra — at 4½d.	—	0.85d.	Primary units at 5d.
Yorkshire .. .. .	9 units per room up to 6*, + 12 units for each of next 6 rooms and 15 for each over 12 rooms — at 4½d.	Units allowed per room at ½d.: 1st, 107; 2nd, 125; 3rd, 178; 4th, 179; 5th, 179; 6th, 178; then + 363 for each room up to 12 and 485 for each room over.	1d.	+ 2.6d. p.u.
North Eastern .. .. .	9 units per room* (max. 135 units) at 4.0 Alternative: 3/- per room p.u.*	Next 9 units per room (max. 135) at 2d. 0.875d.	1d. —	— Flat rate 6d. p.u., less 20%
North Western .. .. .	36 units up to 5 rooms + 12 per room extra (max. 120 units) at 3d.	—	1d.	First 36 primary units at 6d.
South East Scotland .. .. .	15 units per room at 4½d.	—	1d.	Primary units ½d. extra.
South West Scotland .. .. .	15 units per room up to 12 rooms at 4½d.	—	0.875d.	Primary units at 6d.
North of Scotland .. .. .	9 units** per room up to 6, + 6 per room up to 12 and 4 per room over at 5½d. (A)	Nine times number of primary units at 1d.	1d., but in winter ½d. after using further 9 = primary units	—

\*Min. 2 rooms.

<sup>0</sup>Less 2½ per cent for prompt payment.

<sup>0</sup>½d. in Glasgow and part of Rutherglen.

<sup>0</sup>Except in Edinburgh, where primary units are 3½d., and Falkirk and Kirkcaldy where first 12 units per room p.u. are at 4½d.

\*\*Minimum 25 units p.u. (A) 6d. in areas supplied from diesel plant.

The following table from a recent annual B.E.A. report throws some light on British policy in this respect.

Of the two methods of recovering the initial charges, that is the variable service charge and the variable initial block, I would advocate the latter. In the first place rightly or wrongly, it seems to agree with the public sense of commercial justice that a charge should be related to consumption, and the man who locks up his house for a month while he is on holiday, feels aggrieved if he is charged for electricity he did not use. In the second place the initial block allows for a measure of automatic adjustment of any possible overcharge due to the comparative inaccuracy of the method of assessment, in the case particularly of the poorer classes, who are satisfied with only the barest minimum of illumination say a single 60 watt globe per room. It may be argued that a service charge is preferable from the undertakings point of view, but I would point out that in any case this argument can at best be only academic, because taking Johannesburg as an example, the number of fourpenny units, i.e., high rate units sold is at most 4% less than the possible maximum.

The correct pricing of initial units and the cheap units is not an easy matter; it requires data on A.D.M.D.'s and load factors of various types of appliances, and there is a lot of room for useful research in this field. As a rough guide I would say that the cheap unit should be priced at least twice the energy cost and the price of the units in the initial block should be calculated so as to give the total revenue required from the domestic consumer as a whole, keeping the number of units in the initial block as small as reasonable.

I would also repeat at this stage the inadvisability of offering so-called bulk or high tension tariffs for blocks of flats. The room assessment basis already takes account of the "size" of a consumer. The account for electricity is passed on in its entirety by the owner to the tenant, and there is no earthly reason why the tenant should be paying on any other basis than the house dweller for an identical service, or alternatively why the owner should be given an opportunity to make a profit on the electricity supply.

Cheap units for lifts and staircase lighting would be adequate compensation for any costs the owner may incur in sub-metering etc. Finally, the question of the supply voltage is a technical question to be decided on consideration of overall economy. The consumer is in no way interested in the voltage but only in learning the price of a given service.

## 6.2 Industrial tariffs

Dealing next with the industrial consumer, the demand tariff is the obvious choice for the large consumer. The cost of the metering is here of lesser importance in relation to the larger account, and the tariff form is usually understood and accepted by this class of consumer. The question, "When is it economic to start metering demand?" is often asked. It is difficult to answer such a question, for metering costs are unproductive and the value of demand metering as an incentive to improve load factors is difficult to assess. The Johannesburg Electricity Department takes the view that, where an account exceeds £25 per month, demand metering is justified.

The one factor which demand metering does not take into account, and which has an important bearing on the cost of supply, is the timing of the consumer's M.D. in relation to the system M.D. and the group M.D. or, in other words, the diversity. This can be partly corrected in apportioning the demand cost between the demand and the unit charge. The Unit Charge should include not only the energy cost and a profit, but also an additional allowance on account of demand costs. The underlying reasoning is that the higher a load factor of a consumer is, the higher is the probability of his M.D. coinciding with the system M.D.; this probability amounts to certainty when the load factor reaches 100%.

A rational allocation of demand costs can be made by using the same fundamental principle as that used in the E.R.A. report KT/109 previously mentioned. Should there be insufficient data for a calculation as an approximation I would suggest that an amount equal to 150%-200% of the energy cost per unit should be the unit charge, the demand charge being determined to cover the remaining costs.

The selection of a tariff form for the small industrial consumer presents some difficulty. The metering of demand is uneconomical. Some sort of assessment of demand may be resorted to. The obvious form of assessment is on the basis of installed capacity. However, the utilization of the installed capacity is usually less than 100% and there is usually considerable diversity between individual loads within a consumer's installation. This means that generally the charge per installed kW must be lower than the charge per kW of measured M.D.

A tariff of this form would also necessitate a periodic check on consumer's installations, causing also unproductive costs, which should be kept as low as possible.

An alternative method would be to apply a block tariff with a fixed initial block which, though admittedly less equitable has at least the virtue of simple administration, thus lowering unproductive costs.

An important point in framing tariffs is the adjustment of the two tariffs for the same type of consumer in relation to each other in such a way that two consumers with identical loads and load factors, who due to some fortuitous circumstance, are metered and charged for

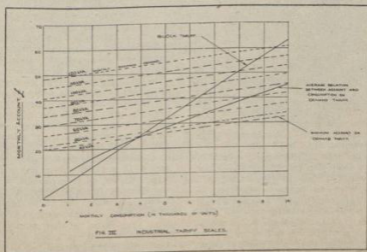
in different ways do not pay significantly different amounts. Thus if the demand tariff is tied to supplies from high tension mains and the tariff for small consumers to supplies from low tension mains, the situation can easily arise that for identical service the two consumers pay considerably differing amounts. This can be obviated if the choice of tariff is made optional and left to the consumer. It is also necessary to ensure that the demand tariff fits in with the alternative tariff in such a way that it becomes automatically applicable to the right type of consumer.

In the attached graph, Figure 7, a method of representation of a demand tariff is given, which allows a block tariff for instance to be plotted so as to make a direct comparison possible. In addition a line is plotted giving the average relation between monthly account and monthly consumption of units.

Figure 7 represents Johannesburg's industrial tariff scales. Scale 2A is a block tariff, which reads—"For every unit up to 80 units per month—4d. For the balance of units per month—1½d.

Scale 2B is a demand tariff, which includes:-

- (a) A minimum charge of £20— which entitles a consumer to a demand of 45 kVA.



- (b) A demand charge of 7s. 6d. per kVA per month or all demand in excess of 45 kVA.
- (c) An energy charge of .3d. per unit.

The choice of scale is optional at the consumer's discretion.

It will be noted that for consumption of less than 3,850 units per month approximately the demand tariff is more expensive than the block tariff, and only begins to be more advantageous when this consumption is exceeded, the difference between the two scales becoming greater, the better the consumer's load factor.

The monthly account on the demand tariff will always exceed £25. Consumers with very bad load factors will find the block tariff more advantageous. This does not involve the undertaking in any loss, since very low load factor consumers, due to diversity between them are not likely to contribute much to the group demand.

The two scales have also been arranged so that a consumer with about 4,000 units consumption is not likely to gain a fortuitous advantage by changing from one scale to the other, unless his load factor is better than average.

Further statistical data are desirable to interpret the full implication of the tariffs, which will be touched on towards the end of this paper.

### 6.3 Business tariffs

Dealing further with business consumers, the demand tariff is again the first choice for large consumers, and much the same arguments apply as in the case of the small business consumer. On the other hand the application of a demand tariff on the basis of assessed demand becomes unduly difficult. This type of consumer is principally a lighting consumer. Globes and lighting fittings are easily changed and notification of such changes cannot be demanded. Thus an assessment of M.D. on installed capacity becomes impracticable, especially in a large town like Johannesburg. Floor area or similar factors cannot be used as they have no relation whatever to demand, as consideration of a comparison of say a warehouse with a 100 watt globe per 1,000 feet floor area and a jeweller shop with a 500 watt or more in an area of similar size, will readily show.

Whether the difficulties of maintaining a tariff based on installed capacity outweigh the disadvantages of a fixed block tariff is a matter of individual opinion; I personally incline towards the simplicity of the latter.

### 6.4 Off-peak tariffs

A word here about off-peak tariffs. As will be readily appreciated, during the night generating plant and distribution equipment are lying largely idle or run at very light loads. Any revenue that can be netted during those hours in excess of the energy costs can be regarded as profit. In fact the marginal cost of a unit during those hours is lower than the average energy cost as the power station operates at those very low loads at its lowest efficiency, and any additional units improve the overall efficiency. Attempts in South Africa to encourage off-peak consumption are few. Johannesburg has in its new tariffs made an attempt to encourage such consumption, but it is yet too early to say with what success. Here again rather expensive two-rate metering equipment with time switches is needed to implement such tariffs, and care must be taken in the framing of the tariff, that due to too small consumptions on off-peak tariffs the benefits of these night supplies are not consumed by the metering costs.

### 6.5 Two-rate time-of-day tariff

One more word about two-rate time-of-day tariffs. These were once quite popular in South Africa for business consumers. It is difficult to say today what the circumstances were at the time of their adoption to justify this rather cumbersome and expensive type of tariff. The basic requirement of a business consumer, particularly the shop owner, is lighting towards the end of the afternoon and early evening, and he is prepared to pay almost anything for those minimum requirements. If these tariffs were intended to discourage consumption during the peak period, they failed miserably in this purpose, because, as an economist would say, the demand for electricity at that time lacked elasticity. If these tariffs were designed to encourage off-peak consumption, they failed in that as well because the low rate was still too high, and the high rate used to extend too late into the

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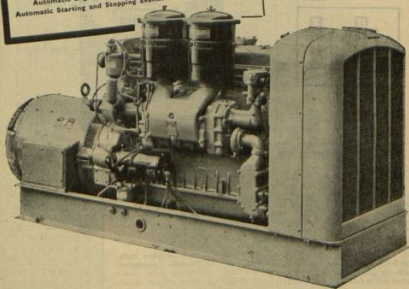
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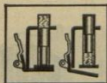
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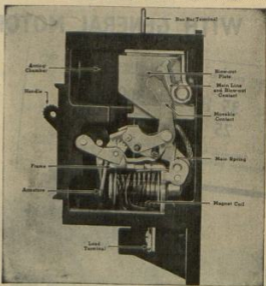


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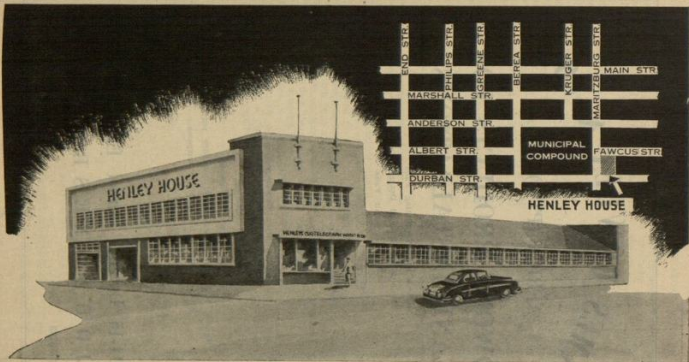
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evening, covering what may rightly be included in off-peak hours. Both the administration and metering aspect of this tariff form are cumbersome and costly, and under present day circumstances no justification for such a tariff can be made out.

### 7.0 Statistical techniques

A few remarks on the more technical aspect of tariff making. When an approach is made to the formulation of new tariffs, it is a great temptation to base calculations of the incidence of various tariffs, as well as the total financial implications on so called representative samples, which are selected on the basis of an intuitive knowledge of what is "representative," supported possibly by the knowledge of the average consumption i.e., the result of a division of the total units consumed on a particular tariff by the number of consumers.

During the preparation of the new tariffs in Johannesburg recently an attempt was made to apply modern statistical sampling techniques to obtain information on sizes of consumer's monthly consumption. A sample of about 600 consumers was selected from a total of about 5,000 business consumers by counting off every seventh from a list including all consumers. The consumers so selected were then arranged in the order of magnitude of their consumption, and the graph in figure 5 was then plotted showing the number of consumers, whose consumption does not exceed a given number of units. The curious result was elicited,

that though the average consumption was 800 units per month, 80% of all consumers had consumptions which were considerably smaller. 50% of consumers had consumptions smaller than 250 units and 25% smaller than 100 units per month.

This not only demonstrates the danger of working on so-called averages, but also the uselessness of tariffs with long initial blocks running often into hundreds of units, as the so called block tariff then amounts in practice to a flat rate for the majority of consumers who incidentally also provide the majority of the revenue.

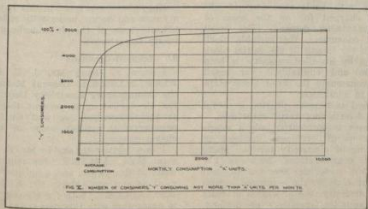
The accuracy of the described sampling technique was at the time estimated to be better than 2% and subsequent experience has proved it to be in fact a lot better still. Similar technique was then used to examine other consumer characteristics, thus graph No. 6 represents the average relationship between demand and consumption of industrial consumers.

### 8.0 Summary

The price for electricity should not be determined by considerations extraneous to the business of electricity supply.

Profits should be reasonable and the stability of the price of electricity should not be endangered by excessive levies on electricity profits.

Tariffs should be equitable in that the account should be determined by measurable characteristics of a consumer's load curve.



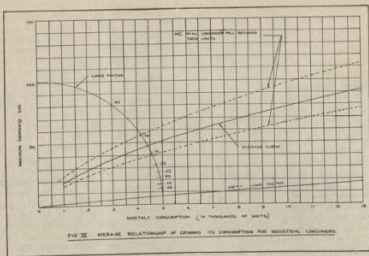


FIG. 11. AVERAGE RELATIONSHIP OF DEMAND TO CONSUMPTION FOR INDUSTRIAL CONSUMERS.

The supply voltage should be determined by considerations of technical convenience, and economy of distribution equipment and should not affect the price of the service.

The total amounts recoverable from a group of consumers, as well as individual accounts as far as feasible should be determined on the basis of a rational cost analysis.

The most equitable form of tariff for residential supplies is by means of a variable block tariff, on the basis of a room or floor area assessment.

Industrial and Business supplies to consumers with loads exceeding 40 kW are best charged for on the basis of metered maximum demand. For small industrial consumers, the variable block tariff with the length of the initial block determined by installed capacity, is both practicable and equitable. For small business consumers the fixed block tariff is easier to administer.

Statistical techniques provide a useful tool for determining tariff structures.

This paper is necessarily only a superficial survey of problems involved in the framing of electricity tariffs. Many important considerations, such as kW versus kVA metering, the use of coal adjustment clauses, the economic significance of diversity, the allocation of costs to bulk supplies, elasticity of demand,

interrelation of electricity prices with those of other forms of energy, special tariffs for special uses such as water-heating, space heating, etc., load limiting in relation to tariffs, the desirability or otherwise of service charges, multi block tariffs, transformer rents, and certain new experiments in tariff making and metering in the U.S.A. have not been included in this paper due to space consideration.

Much research may yet be undertaken and can contribute substantially towards the maintenance of a supply of power at reasonable prices to the South African public.

Many views expressed in this paper are my own and do not necessarily reflect the official views of the Johannesburg Electricity Department.

## 9.0 Acknowledgements

I have to thank Mr. J. C. Fraser, M.I.E.E., M.L.MECH.E., General Manager of the Johannesburg Electricity Department, for his invitation to present this paper at this convention, as well as for his permission to publish some of the included material.

I owe further thanks to Mr. R. Leishman, M.Sc., A.M.I.E.E., for reading the draft of this paper, and some useful suggestions and particularly Mr. A. J. Levy, B.Sc., A.M.I.E.E., both for his suggestions in connection with this paper, and also for

months of fruitful and patient collaboration in the work, the results of which have been partly summarized in this paper.

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PRESIDENT: Mr. Pulik: You will have gathered from the acclamation by the members that you have presented a very interesting paper to the Convention.

I, first of all, want to apologise that this paper was not posted to members earlier, but Mr. Pulik had the unfortunate experience of having his first draft stolen out of a motor car along with some other papers. So he had to start all over again and he was very late in getting it out.

I have been approached by four members to take part in this discussion; it is quite possible that there are many more members who wish to do so, and probably we will run out of time for discussing the paper, and I would like all members who are not able to take part in the discussion to favour us with written contributions, which will be included in the *Journal*.

PRESIDENT: I now have pleasure in calling upon Mr. Milton to propose a vote of thanks to Mr. Pulik.

*Readers are requested to note that for easy reference all contributions to Mr. Pulik's paper whether these were read at the convention or communicated later have been collated and recorded hereunder.*

Mr. W. H. MILTON (Electricity Supply Commission): Mr. President, ladies and gentlemen, it is my privilege to propose a vote of thanks to the author for the considerable amount of time and trouble to which he has gone in preparing his paper for presentation to this Association.

I believe this is one of the first papers on this subject contributed to such a meeting as this in the Union of South Africa.

The subject he has chosen is one which is controversial because reasonable tariff design must be based very largely on scientific analysis coupled with traces of intuition and experienced compromise. Many people seem to hold the view that tariff structures are based very largely on what is expedient or have little relation to analytical study, but the author has shown us conclusively that this is not the case. Many tariff designers are, of course, faced with the fact that they must take into account the incidence of tariffs which have been in force for a long period preceding the necessity for a change. Few of us are in a position to put forward tariffs *de novo* and, therefore, free from restrictions of historical significance. In offering my very sincere congratulations and praise to the author, it is fitting that we should also acknowledge our thanks to our President for permitting the author to prepare and present his most valuable paper to this Association.

May I now proceed to a discussion of the author's views.

At the outset the author has quoted Mr. R. V. Saunders who expressed the opinion that tariffs must be a compromise between the costs of supply to the class of the consumer, the cost of actually recovering those costs, and the preference of the consumer as to the method by which the costs of supply were collected from him. He also supplements this quotation by expressing the view that tariffs must be easily understood by the consumers who generally are not familiar with such concepts as "demand." This surely is a matter of education, and we must look to the day when consumers

are familiar with the terms which we use when calculating the amount to be charged for the service rendered them.

This process of education is quite natural, as with the development of all the social amenities against which the charges are raised, the early pioneers of those services must surely have been faced with the same difficulties of the understanding of terms used when discussing matters with their customers. I would even venture to suggest that amongst the body of my listeners there is a large number which does not fully grasp the significance of various measurements of land, liquid, grain and other commodities, with which commodities we are quite familiar, and which measurements, when they do become applicable to the individual who does not understand them, are accepted as recognized standards of such measurements. I am sure we can look to the day when the standards of measurement in electricity supply will also be readily accepted. Much of our present difficulty arises from the precedent established by the different forms of measurement used in the early days of the electricity supply industry when deciding the amounts of the charges to be raised against consumers.

Coming to more detailed comments, the author commences his paper by drawing attention to the effects of post-war inflation on the supply authority's economy and expresses the view that, for reasons which he states, the increase in annual costs has been limited on the average to figures not exceeding 20 per cent. This limitation is variable over a wide range depending upon the particular supply industry concerned and its age. It will be observed from the author's qualifying statements that this question of age and the extent of pre-war purchased assets will have a material bearing on the extent of the increase in costs expressed as a percentage of pre-war figures.

He does point out, however, that as old plant becomes obsolete and as existing capacity is augmented, the possible increase in the costs will amount to a figure which is double the 1939 figures and, therefore, he indicates the possibility of a rise in the price of electricity to twice the prices which were in force during 1939.

Unless there is a deflationary tendency which will reduce not only material costs appreciably below present day figures, but may have some effect on labour costs, the author is undoubtedly correct in his conclusion.

In these circumstances both supply authorities and users of electricity should always bear in mind that the cost of electricity is likely to continue to increase for some considerable time and new ventures should not be planned by a consumer on the basis of present day prices with complete disregard for the almost inevitable increase in the cost of electricity. Fortunately this tendency is world wide in its incidence and, from the point of view of competition, it should not act as a deterrent to development in any one particular place, or cause preference for the selection of some alternative site where prices today are lower by a considerable margin than in some other place. Any such difference in tariff rates should be examined in the light of probable further increases in electricity costs.

It is perhaps a little unfortunate that electricity tariff increases have lagged behind the increases in the prices of the majority of the commodities which we use in every day life. Many of these commodities may have already felt the incidence of these increases in cost to their full extent (unless there is a still further increase in the price of the basic material used in the production of the particular commodity). In most instances it would appear that the general public has become accustomed to paying prices very much in excess of pre-war prices for most of their commodities and now find it hard to believe that electricity itself must also increase in cost.

It is also observed that the author recommends that a committee should be formed in connection with electricity tariffs. I do not agree wholeheartedly with the author in all the details of the working of the committee but would very strongly support the suggestion that such a committee, if formed, should institute and encourage research in respect of the necessary data required for sound tariff construction.

There is far too great a tendency to divert our energies to the extension of our electricity undertakings and to the development of loads without due regard

to the relation between the cost of that work and the ability of consumers to meet those costs.

The development of the use of electricity in the home has been continuous for a large number of years and those of us who have been fortunate enough to have available the staff to collect the necessary data, have been able to indicate the nature of those changes in relation to their incidence on the cost of rendering the service. There is no question but that the characteristics of a community must differ for geographic reasons and for other reasons such as the activity of the community, e.g. as to whether it be manufacturing or agricultural. In these circumstances the data collected in other countries can only be used as a guide in respect of the characteristics of the requirements of consumers in the Union of South Africa but cannot be quoted with certainty as being true for any community in the Union. The extent of development in other countries is such as to be able to support the expenditure on the necessary research and although I feel that in a number of places in the Union the expenditure would be warranted on the basis of our own development, the more universal acquisition of knowledge cannot as yet be justified.

It is rather significant that in the United Kingdom, recommendations as regards the standardization of tariffs and tariff design have been made from time to time but, inevitably, those recommendations are qualified insofar as the designers have been urged to take into account the change in incidence of tariffs on consumers concerned and to make their corrections in stages where they would otherwise be too abrupt. This means that for some time to come compromises may be necessary but the basic recommendations definitely remains, namely that those compromises should be completely eliminated with the passage of time.

The author also recommends the advisability of what may be termed a "Tariffs Stabilization Fund." For my own part may I say "how I envy him."

In the case of the Electricity Supply Commission it is not possible to establish such a fund within the terms of the Electricity Act although to some extent

the Commission is in a position in more fortunate times to adopt a policy which approaches in some degree the establishment of that fund. I refer to the ability of the Commission to carry forward surpluses from year to year. Of course from a consumer point of view, the consumer is in turn in a position to demand that those surpluses should not assume large proportions and in the light of the present day trends large sums should already have been accumulated against the contingency of excessive increases in tariffs being required at any one particular time.

How right the author is in saying that during periods of reasonable economic stability the tariffs may remain stable for very long periods of time and only require modification when there is some abnormal change in the particular conditions requiring to be met. This is, of course, as he points out, the acid test of the basic soundness of a tariff structure, and the ability of an undertaking to operate for many years on the basis of unaltered tariffs notwithstanding continual development of load on that undertaking at a rate averaging say 10 per cent per annum has, in the past, been possible where tariffs have been sound. The change in incidence of costs on the tariff structure which has been introduced by war time and post war inflationary tendencies is what makes it so difficult for the tariff designer to keep pace with the change and maintain a satisfied clientele.

In dealing with some of the fundamental requirements in connection with tariffs, the author makes the statement that care should be taken not to include a unit charge which is lower than the cost of fuel burnt at the power station. This I feel is acceptable only where an efficient steam station is involved.

I have in mind that possibly the majority of the members of this Association operate crude oil Diesel engine driven sets. A characteristic of this type of plant is a relatively low capital expenditure on the installation of generating plant coupled with a markedly high average fuel cost per unit sent out of those stations.

If one develops such a station and system on the theoretical basis of tariff structure as outlined in the author's paper, there is a tendency towards a

rather low demand rate coupled with a very high rate which may stultify development.

Bearing in mind that the effect of development will be to bring these undertakings into the condition where generation can be replaced by a steam installation, the tariff designers should have this aspect in mind.

As the load factor of a municipal undertaking as a whole follows very closely a fairly well defined change from the time of the inception of the undertaking to its latter day development where that change almost ceases, a case may be made in many instances for the sale of units at less than the average fuel cost with compensatory higher charges on the demand side. If the tariffs are carefully designed the change from Diesel driven units to the ordinary steam thermal station does not require a marked variation in the tariff structure and the development of the undertaking can be encouraged throughout the transition period and thereafter (once the new thermal plant is brought into operation) without the necessity for any major changes in the tariff structure which might have an adverse psychological effect on consumer requirements.

The author has fearlessly stated his views in respect of a tendency on the part of many consumers today to protest that they should not pave the way for future generations to enjoy what the present generation is providing.

There is also a tendency today on the part of consumers who have been using electricity for a very long time to object to present day increases on the grounds that they have not been a party to the causes of those increases. This is somewhat similar in its root cause to the attitude which the author condemns. As a community of people, we must live from day to day on the basis of present day conditions; looking back does not help nor does a tendency to pass our burden onto the future assist us in any way. In the past we have enjoyed low prices and other advantages which are no longer available to us. Vain regrets will not bring back those conditions. If we attempt to shed our burden at the present time in the hopes that the future will be able to carry that burden, I very much fear that we ourselves will enter that same

future period and face burdens which will then be quite unbearable. The burdens of the future viewed entirely on their own will be sufficiently hard to bear without having added to them something which we have shirked carrying in the past.

Coming to the question of the allocation of costs to their root causes, the author follows the view point which has been expressed by other authorities operating undertakings outside the Union in that he points to the necessity for making some allowance for the contribution of various groups and classes of consumer to what are termed the demand related costs on a basis of "peak responsibility."

Where the electricity supply industry is not well developed and particularly in the smaller undertakings, it appears almost impossible to say with certainty who is responsible for the peak period. Bearing in mind that this question of peak responsibility on which costs would logically be allocated, has for its basis the extent of plant capacity which is installed to meet the requirements of the consumers of an undertaking, one is faced with the problem as to whether the undertaking has been established to furnish the domestic supply or whether it was established for industrial purposes.

Normally an electricity undertaking in the Union is first established to furnish the requirements of the domestic consumer and the requirements of industry are of secondary importance in the selection of plant capacity. The industry is developed on the basis of plant availability and with the laudable object of reducing the cost to the class of consumer for whom the plant is installed, by making use of that plant capacity which will remain idle if other avenues for the use of electricity were not explored and developed.

It is only after a supply authority has developed over a period of a large number of years that the peak responsibility must be studied with great care to ensure that the various classes of consumers concerned are charged for their contribution for that responsibility.

Until such time as there is ample justification for dealing with the supply to various classes of consumers on the basis of peak responsibility, I personally hold the view that it is justifiable to calculate the costs to all users on the basis



that each group is entitled to share in the costs as if all were similarly responsible for the peak condition. At first sight this would appear to be a radical departure from the proposals that tariffs be designed on the basis of peak responsibility but a closer examination of the problem will show that the departure is not very marked although, in certain instances, small groups of consumers might benefit very appreciably by allocating the costs on the basis of peak responsibility. I would submit, however, that such benefit might not be justified with greater development of the undertaking and probably that the development would be encouraged in such a way that a recast of the position some years later would show the necessity for reducing the benefits to a particularly favoured class. Any attempt to modify the tariffs to reduce those benefits would, however, be looked upon by the consumer with justifiable concern. One can imagine that the development of a particular type of load might be encouraged on the basis of the economical study of the problem by the user of electricity. If the prices are then increased due to that consumer's very development on the basis of a change in the conditions of peak responsibility, the economics of the user's business might be so badly affected as to make his business unpayable. This is an extreme, but it is an extreme that must not be lost sight of by the tariff designer in the Union. These remarks may seem to be at variance with those which I have previously made on the subject of increasing prices. They are not at variance however, because under the conditions which I have mentioned earlier, the user of electricity is faced with increasing prices in all directions and, therefore, his competitive market is similarly affected by way of increases. If the price increase is not accompanied by increases upon all users and all producers, then the economic structure of the users' works or users' business is definitely upset. It is this latter type of disturbance which is produced when there is a change in peak responsibility on an undertaking and tariffs are based on that very peak responsibility. As an example, one could quote an undertaking established shall we say for a domestic load with a very substantial peak during the evening hours.

Tariffs could be offered at off-peak rates for a day load, but if there is a prospect of the undertaking developing to the stage where the industrial requirements may outweigh the domestic requirements, the time will come when the peak responsibility attaches almost entirely to the industrial or day load, in which case heavy demand charges would require to be imposed. Any business whose establishment has been made possible only by special off-peak rates during the day might be rendered bankrupt by the imposition of charges for demand responsibility to the extent of meeting the majority of those costs of the supply authority. It is changes of this order which may serve to illustrate the point I have in mind.

This question of peak responsibility and the allocation of costs on the basis of this factor has exercised the minds of tariff designers for many years. The author points out that the British Electrical and Allied Industries Research Association has issued a treatise on an improved method for allocating to classes of consumers the demand related portion of the standing costs of electricity supply.

This Authority advocates, *inter alia*, the allocation of the demand related costs on the basis of the "potential peak responsibility" rather than the "actual peak responsibility."

In this method the so called "peak period" is inclined to include potential peak periods, and to consider only those periods as off-peak, which have no prospect in the foreseeable future of becoming peak periods.

This method, which is advocated by the author, overcomes many of the aforementioned difficulties associated with the allocation of the costs on "actual peak responsibility."

In an extensively developed supply undertaking such as that operated by the British Electricity Authority, there seems to be every justification for the application of these recommendations.

The remarks of the author on the subject of residential tariffs are most interesting and his opinions most valuable.

At first sight his remark that consumers may not be able to understand demand tariffs, is no criterion that such tariffs should not be introduced as soon as it is possible to do so.

At one stage consumers could only understand that they were required to pay for lamps. Since that time they have learned that they are required to pay for something which is referred to as a unit and which is indicated on the dial of a meter. I am quite sure that the vast majority of residential consumers have no realisation whatsoever as to what a unit is and, therefore, if the charge were to be based on a demand and on units, there is no doubt that the residential user would become just as accustomed to receiving his account based on these two figures as he is at present accustomed to receiving his account based on the figures of units, terms which he cannot possibly understand in the majority of cases.

This, however, is a passing comment because it is only of academic significance, no suitable demand meter being as yet available. On the other hand, however, supply authorities should not deal with this question on the basis of whether or not such a form of charges "would be acceptable to consumers" because if equity demands such a system of charging, then those few consumers who fully realize the significance of these terms and the equity of a charge based on such terms, should receive preferential treatment in the matter of the introduction of such tariffs leaving the remaining consumers either to learn by education what these terms mean or to learn by education that they are equitable and must be accepted.

In the absence of suitable demand metering and the establishment of tariffs based on such metering, I agree with the author in his statement that a tariff containing a quota of high priced units based on the assessment of premises or a simple two-part tariff based on a similar assessment, is the only satisfactory means of fairly allocating costs of supply between these residential types of consumers.

The selection of the amount of the service charge in the two-part tariff or the number and price per unit of the initial quota of units in the block type of tariff where the block quota is also related to an assessment of the premises in the same way as a service charge in the two-part tariff, is not a simple matter and must have regard to the psychological effect on consumers of

the prices, etc., which are actually ultimately selected, but at the same time must have regard to probable equity on the basis of average conditions.

I do not agree with the author in his reasons for selecting the quota of high rate units in place of the service charge of the two-part tariff for the purpose of applying domestic tariffs. The public sense of commercial justice to which he refers is again a matter of education by supply authorities and it seems to me that the argument put forward by the author is not entirely sound. In most cases where a man locks up his house for a month while he is on holiday he finds in due course that the supply authority submits him with a pro forma account which covers the quota units still at the high rate although he has not used it. Alternatively, in the case of other supply authorities, no account is submitted for that month of his absence, but, in due course, the quota of high rate units is doubled in the ensuing month to compensate for the fact that the meters were not accessible during the period the house was locked up. In other words the quota rate applies whether the house is locked up or not unless the consumer has applied for temporary disconnection of his premises. This means that whether a service charge or a quota rate was applied the consumer's redress is to obtain temporary disconnection, paying the normal reconnection fee which is usually a relatively small amount and less than the amount of the normal service charge. A further point which seems to completely offset the author's remarks regarding commercial justice, is that the total number of high rate units sold is at most 4 per cent less than the possible maximum. This must surely mean that the majority, and in fact the vast majority, of consumers receiving supply on the author's basis pay in any case the full service charge and the fact that they do not realize that they are doing so and are in fact bluffed in this way, should not be construed as justification for avoiding explaining to the consumer that he is in fact paying a full service charge at all times.

It is admitted that a number of small consumers making relatively little use of electricity in relation to the size, i.e. the assessed size, of the premises in which



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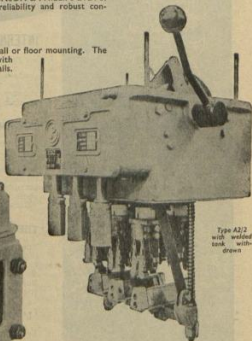
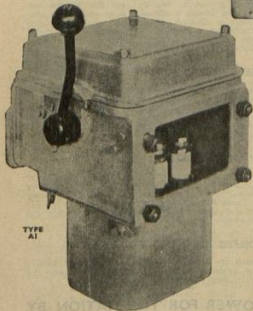
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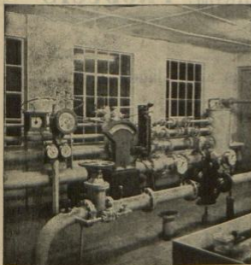
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they dwell, would be severely handicapped and penalized if the full service charge were to be made, can readily be met by the introduction of an alternative flat rate charge. This is ample compensation to the supply authorities for the service rendered. The flat rate in such a case would be the necessary high rate which the author himself says would be too high for general application for all services just as the follow up low unit rate in the two-part tariff or the block tariff would be too low for general universal application as a standard charge throughout.

It further seems to me that it is necessary for supply authorities to impose a minimum charge for the service of supplying electricity. The author has clearly stated that a portion of the cost of an electricity undertaking is "consumer related," and those costs have no regard to the magnitude of a consumer's demand or the number of units which he uses. Such costs should, therefore, be recovered from each and every consumer regardless of the extent of his use. This return to a supply authority can only be secured in all circumstances by the imposition of some form of minimum payment.

Coming to the question dealt with by the author in connection with the difficulty of obtaining complete data in respect of the A.D.M.D.'s and load factors of various types of appliances, etc., I would submit that the approximations which supply authorities are compelled to adopt must very closely approach the information which could be obtained if supply authorities will go to the very considerable expense of making the required measurements to obtain this data. I would also suggest that it is not unlikely that data so collected over a long period of time would indicate very considerable variation in the after diversity maximum demands and that the authority would require to operate his tariffs on the basis of some mean figure obtained from such data. In other words the expense of obtaining the data would not be justified by the ultimate approximations which would be necessary and that, just as the maximum demand of small residential premises is not measured because it is not economical to do so, in the same way it is not likely to be economical to go to the expense of determining after diversity maximum demands

with a view to more accurately applying tariff rates. This, of course, is not true where it is possible for a large undertaking to deal with some small typical section or typical sections of its system which involves a minimum of expenditure in obtaining data for general application.

I note that the author has recommended that the follow on unit rate, namely the charge to be made per unit for the low priced units, should be at least twice the energy cost. It is not a difficult matter to determine the extent to which the excess of the low priced unit over the energy cost contributes towards the demand related costs and so shows that the more extensive use of electricity by a consumer in an all electric house meets the cost of his greater demand. I would go further than the author and point out that the price set upon the low priced units should normally lie between twice the energy cost and four times the energy cost and, in many instances, a figure closely approximating three times the energy cost would probably be nearer the mark in endeavouring to obtain an adequate return from the all electric house as compared with the return from consumers using lighting freely and making use of sundry small domestic portable appliances.

It is very clear that as all these tariffs must necessarily be approximations, no hard and fast rule can be laid down and only guides can be used. Such guides must have due regard to the characteristics of the particular community and particular electricity undertaking which is under consideration, and cannot be used by the inexperienced and uninitiated if the use is to be reasonable in its application to the consumer who is ultimately called upon to pay the piper.

I fully agree with the author's comments regarding the question of the charge for supply to such premises as blocks of flats and the objection which arises if such premises are charged on the basis of bulk supply rates or high tension tariff rates. Such a system of charging introduces the possibility that the owner of the premises may charge the tenants on some arbitrary basis which has no relation to his costs or to the costs to him of electricity supplied. If such premises are supplied on the basis of the assessment of the number of rooms,

then there is a direct measure of difference as between the cost of supply to the owner of the premises and the tariff which he ultimately charges his tenants. This "resale" of electricity by owners of premises always introduces a difficulty on questions of legality and equity of charges.

On the subject of the industrial tariffs, the well-known difficulty of selecting the point at which it becomes desirable as well as economical to measure the maximum demand of the consumer for purpose of charging, is mentioned by the author. From the paper one would gather that it is the economical aspect which tends to control the selection of this point. I feel sure, however, that the author does not intend this to be the complete interpretation of his statements. He himself has drawn attention to the difficulty which faces a supply authority in determining the basis for assessing the equivalent demand for the purpose of his charges. In the same way a consumer is apt to look askance at his account when he realizes that the "high rate" portion of his charge is based on, say, an installed capacity, whereas he realizes his actual demand on the system is a mere fraction of the potential demand of the installed capacity. For this reason I hold the view that the measurement of maximum demand may be introduced at what may be termed a subeconomic level in order to give satisfaction to the consumer supplied and to ensure as far as possible that consumers are reasonably treated in the region of the point of transition.

The author is of the opinion that a block rate tariff is preferable to a charge on the basis of assessed installed horse power (for example). It is more usual to relate the high rate block of units to the installed horse power for the reasons which are set out in support of the assessment of domestic premises, for example, on the basis of the number of rooms or the floor area.

Any such method must of course show anomalies when a number of individual applications of the tariff are under consideration but the extent of these anomalies is always fully justified by taking into consideration the expense to which a supply authority would be put if called upon to make accurate measurements would far outweigh any benefits

which might be likely to accrue in a removal of such anomalies.

Supply authorities face a very real difficulty in the assessment and design of the tariffs for the small user in the industrial category whose demand is not metered, but it is generally accepted at the present time that the basis of the installed capacity is the most reasonable one to adopt.

Various supply authorities differ in their views as to whether the tariff should take the form of a number of high rate units per installed horse power followed by a low rate unit charge or whether there should be a service charge per horse power installed, with a standard unit rate.

In this connection I personally hold the view that a service charge is preferable both in respect of the residential tariff and the small industrial tariff as this system of charging provides for the introduction of the same unit rate whether electricity is used in the home or for small motive power operations.

A particular advantage which accrues from this method is that a single meter may be used for the measurement of energy regardless of the use made of the electricity by the consumer. If high rate units are involved in respect of residences and further high rate units are involved in respect of motive power, it is essential that the consumer should wire his premises in such a way as to enable each supply to be separately metered. This is not always convenient particularly in the case of rural consumers whose premises are often served by the consumer's own overhead distribution network.

In the case of a municipal undertaking these difficulties may not arise, but where supplies in rural areas are involved these difficulties become quite appreciable as the expenditure on metering equipment is unnecessarily large in respect of both the initial outlay in the provision of meters and also the maintenance and testing of these same meters.

If the concept of the same unit rate for small industrial power and residential supplies is followed, then, of course, the equivalent low unit rate will amount to between two and four times the industrial large user unit rate, this differentiation having been mentioned earlier by the author and by myself.



I do think the author has sufficiently stressed the fact that, when dealing with these small industrial rates, i.e. applicable to consumers with say less than 25 kVA or kilowatts of maximum demand, the diversity which is experienced in general is extremely large. There are, of course, cases where these small supplies which are classed as small industrial supplies, are true to their title and the premises are operated in the usual single shift working over the same hours as the large industrialists. In these cases of course the diversity as between consumers in this category is not very large. On the other hand, this tariff is applicable to such a wide range of consumer applications that in larger undertakings the overall diversity is occasioned by a number of users making very casual use of the supply in terms of this tariff.

This again points to the necessity for each supply authority to study the problem in the light of the requirements of the consumers that particular supply authority serves and will account, in many instances, for considerable differentiation in the treatment of the tariffs particularly in respect of the inter-relation of the large user and the small user tariffs.

The author has touched on the question of policing premises to ensure that installed horse power is not modified without an appropriate modification in the tariff of charges. This is an argument of no great weight because the alternative presupposes that it does not matter what a consumer does, the tariff applied remains unaltered (with the block rate system unrelated to installed horse power). If then the installed horse power basis is used, and no policing is adopted and consumers do make alterations to their installed horse power from time to time without notifying the supply authority, then supply authorities' revenue would be the same as if the block rate were adopted. The effect of increased revenue obtainable from consumers who duly notify the authority and where the horse power or installed capacity basis is used, would not be obtainable from the alternative system and from that point of view such policing as is necessary is probably fully compensated by the additional revenue accruing from the increase in the charges to particular consumers.

In most instances it is a breach of the regulations of a supply authority for a consumer to modify his installation without the permission of that supply authority or alternatively without having notified the supply authority and the majority of consumers must be regarded as honest.

To some extent the same question of policing is said to arise wherever the residential tariff is selected on the basis of an assessment of the number of rooms in premises supplied. Here, again, the owner of premises is not permitted to alter those premises without advising either the supply authority or the municipal department concerned where the supply authority is a municipality. To this extent, therefore, the policing becomes automatic if the consumers comply with the requirements of the supply authority as regards notifications and permissions. It is admitted that the alterations in respect of electricity installations are not so strictly applicable as the alterations to the premises themselves but, nevertheless, from the point of view of the legality of the consumer's action, the conditions are the same.

As regards tariffs for application to business premises, the author overcomes the supply authority's difficulty by selecting a system of charging which inclines towards simplicity. A tariff designer's difficulties in connection with this type of consumer must be studied to be realized in their enormity. Personally I prefer the assessment of premises on the basis of either floor area or number of rooms as providing the best means of allocating costs between this type of consumer. It must be admitted, however, that in many instances the assessment of premises in relation to the load from those premises is extremely wide of the mark. This diversion is overcome by the introduction of the flat rate tariff as an alternative to a tariff based on the assessment of premises and, it is widely acknowledged, that where a service charge is raised on the basis of the assessment of premises an alternative flat rate should be introduced.

The author mentions the advisability of introducing off-peak tariffs to encourage use by consumers during the "valley period." To my knowledge a

tariff of this description was made available to consumers on a municipal undertaking for a period of some 7 to 8 years but no consumer availed himself of the low rates offered in those circumstances.

Whilst appreciating the desirability of encouraging the sale of electricity during this period in order to enable a supply authority to maintain its boilers and generating plant hot, there are of course limitations from the supply authority's point of view, namely those imposed by the reduction in the amount of plant which can be taken off for running overhaul during this valley period and the necessity which may arise of maintaining additional generating plant to enable such running overhauls and repairs to be carried out, and there is also the aspect of the consumer's position to be studied.

In the vast majority of cases of the application of electricity to industrial and other purposes, the actual cost of electricity itself is usually represented by a very small percentage of the total cost of the industrialists' product. From the point of view of the domestic user, electricity is regarded as an amenity and not as something which should be used at some specific time to obtain the benefit of that use at the lowest rate possible. As an amenity it serves its purpose only if it can be used and when the need for that use arises without regard to time of day (or night). If the cost of electricity at full tariff rates represents from a fraction of a per cent to say 3 per cent to 4 per cent of the total cost to a manufacturer or industrialist of producing a product for the market, then one must weigh the saving in cost offered by off-peak tariff rates against the other costs and inconvenience to which the user is usually put.

In practice the night shift is seldom as efficient as a day shift and supervision during night shift working is usually more onerous than supervision during day working. The actual product of the persons employed during the night shift is seldom up to the same standard as the product of the same workmen when produced during a day shift.

The actual handling and attraction of a labour force to operate during night shifts presents far greater difficulties than in respect of a day shift.

In these circumstances a supply authority should not be over-optimistic of attracting very much load to the valley period (which usually occurs during the night) by offering off-peak tariffs which must necessarily be subject to certain limitations of cost if that load is to be really worth-while to the supply authority. If off-peak tariff rates are introduced then the argument may arise with the normal industrial consumer supplied with electricity at standard tariff rates because he operates during the day to the effect that during the off-peak period he should be subjected to off-peak tariff rates and not to normal on-peak tariff rates. In certain circumstances this can of course involve special metering arrangements controlled on a time switch basis in order to give effect to differential rates between off-peak and on-peak periods.

In my opinion the disadvantages attaching to the establishment of the standard off-peak tariff are so great as to outweigh the advantages likely to accrue to a supply authority from the use of such tariffs as a standard procedure.

The majority of industrialists are well aware of the fact that, by approaching a supply authority, there is every prospect of negotiating a specially low rate for application during the off-peak period and any industrialist who is able to restrict his requirements to the off-peak period is almost certain to approach the supply authority concerned with that end in view.

I do not quite follow the author in his statement that care must be taken when framing the tariffs that due to too small consumptions on off-peak tariff the benefits of these night supplies are not consumed by the metering costs. It seems to me that the off-peak tariff can only be offered to substantial loads in the same way that the on-peak tariff is applied to the larger industrial users.

If off-peak tariffs are to be offered to encourage, shall we say, water heating during the night, then the maximum benefit which can be offered to a consumer is the difference between the unit rates included in the large user industrial tariff and the unit rate included in the residential tariff. The advantages which would accrue to a consumer on this account are likely to be off-set by the extra cost to that consumer of providing sufficient

thermal storage to ensure that hot water is available throughout the period not represented by the off-peak period and, from a supply authority's point of view, the revenue accruing during the valley period would present very little benefit on a balance of cost basis. On the other hand, of course, it must be appreciated that if water heating were restricted to periods which are off-peak from a generating plant point of view, sufficiently appreciable savings might be involved in installation costs to justify specially low rates during the valley period.

This impinges on the earlier statement made by the author namely that the lower unit rate should not be less than the average fuel cost.

In other words, there are circumstances which would justify the application of a unit rate which is less than fuel cost if by doing so on-peak costs can be avoided which are not normally recoverable from the consumer concerned in view of the nature of the tariffs applied to his particular form of service.

The consumer's comments on the two rate time of day tariff emphasize my remarks in connection with the cost of power in relation to a consumer's general costs. He points out that certain consumers will pay almost anything for their minimum requirements of electricity for a particular purpose (in this case shop window lighting). This is due to the fact that the value of the service far exceeds the charge made by the supply authority for that service, the charge based on the cost of the service.

In summarizing his paper the author has drawn attention to the fact that there is a multiplicity of facets of tariff design which he has been unable to deal with in view of time and space limitations.

One aspect which I omitted to mention earlier was in connection with the change over from the small industrial to the large industrial tariff. I have agreed with the author that there is a minimum limit to the demand which can economically be measured for the purpose of applying tariffs on a demand basis. The tariff designer has perforce to adopt an attitude of assessment of demand below that economic figure. In these circumstances it should not be compulsory on any consumer

to change from one particular tariff to the other at a particular actual maximum demand.

In fairness to the consumer, there should be a range of choice as between the two alternative tariffs, namely that for the small user and that for the large user. I would suggest as a criterion that no user of the small category should be required to adopt the large user tariff until his actual maximum demand has reached a figure of say twice the minimum applicable in respect of a user who is in a position to select the large user tariff for application in his case. If there is a case where the consumer's maximum demand actually exceeds, say, twice the minimum and that consumer prefers the "small user" tariff, it means that that consumer's load factor is extremely low and he is, therefore, not willing to pay for the plant and equipment the supply authority must necessarily install to meet his demand requirements. From this point of view, therefore, it is essential in the interests of all consumers that it be compulsory for a consumer to receive his supply on a measured maximum demand basis at a certain pre-selected maximum demand even though the selection of that limit is somewhat arbitrary. This point is touched on by the author but his approach is somewhat different from that which I have just outlined.

Mr. President, gentlemen, at the outset of my remarks I proposed a vote of thanks to the author and I feel sure that my discussion on his paper will bring home the fact that to my way of thinking he has made a very valuable contribution to the proceedings of this Association and one which will serve as a guide to many a supply authority, Engineer or Manager, as the case may be, when dealing with the problems of equity of tariff design and application.

Mr. J. L. VAN DER WALT (Krugersdorp): Mr. President, gentlemen, I have heard it said previously, that mentioning tariffs today is dynamite.

For a convention of this nature, the author could not have chosen a better subject. It is and must be an item of interest to both the Councillor Members and Engineer Members. I would like to congratulate the author on this very

excellent piece of work. I am sure it will be discussed and thought of long after Convention adjourns.

I personally like the idea put forward that the A.M.E.U. establish a working committee on the lines suggested, with this proviso, that they complete their work well within 20 years and make definite recommendations.

*With regard to profits*, it appears that in most countries, including South Africa, there exists legislation with the object of protecting consumers from exploitation by suppliers. In South Africa, however, Local Authorities were exempted from this legislation. I fully agree with the author that using some of the profits towards relief of rates is a fair practice, thus forcing most of the citizens, whether Ratepayers or not, to contribute towards the expenditure in providing non-productive services. The exemption Local Authorities have obtained, probably reflects this principle. A note of warning here would not be out of place. Local Authorities have obtained great powers, far greater than any private enterprise can ever hope to obtain. They have a monopoly and they should be on their guard not to exploit it.

The author mentioned the established practise in Municipal Electricity Undertakings to discriminate against business consumers. I cannot agree here, the reasons being:-

- (a) Shop lighting has a poor load factor, outside their group load factor mentioned by the author.
- (b) Its maximum demand often coincides with the peak, it may even make the peak.
- (c) The demand cost of the business consumer is higher than for any other consumer. Being situated in the business centre as a rule. Capital outlay is heavy, on account of the many other services in such a concentrated area. Usually the distribution is by means of underground cable.

The author's own description of the business consumer also gives a certain amount of reason for discriminating. It must also be born in mind that the business consumer uses electricity for gain, and not out of necessity.

It is an indirect aid in selling his goods, and he will therefore be prepared to pay for it.

Is it not a question of demand and supply? The business man will have it at a relative high price. Making this price more attractive, will not cause him to use more electricity.

The author must be taken to task for recommending the variable block tariff on a basis of room or floor area for residential supplies as the most equitable form of tariff.

In his argument on domestic tariff, it has been said that the allocation of demand costs are impracticable. Of the two most popular methods, the room or floor area assessment basis, he said they can only be regarded as rough approximations. There I agree entirely. Nowhere has any proof been given why the room or floor area method is preferred to the much simpler block or sliding scale method.

It is true that in Britain, the room basis method is preferred, in an attempt to standardize tariff structures. The technical reasons given are certainly not convincing. Tracing the history of this recommendation and reading between the lines, I am of the opinion that the main reason was on account of a large scale survey held. The majority of structures probably being on the room basis would therefore have been the natural choice. It would be interesting to know what a survey in South Africa would reveal. Is it not due to the fact that originally loads were purely lighting loads in which case the room basis would be equitable? It can and has been proved that the sliding scale tariff can produce, for all practical purposes, the same revenue as the room basis. Why then select the more cumbersome tariff? It is admitted by eminent authority that the sliding scale is the better choice for business and small consumers. Why not domestic? This Convention in 1944 was of the opinion that the sliding scale was preferred for business and small consumers.

I personally think that it is most dangerous to recommend to any undertaking what form of tariff should be applied. That decision can only be taken by knowing intimately the local condition prevailing.

Both methods are based on arbitrary assumptions. Both have their pros. and cons.

The room basis is most inequitable where flats with their large electrical installations are concerned. Opinions have been expressed that equity in supply tariffs to domestic consumers is not of such great importance, as long as the tariff is so low that it is well within the means of all consumers.

The room basis tariff definitely does not treat consumers similarly situated on an equitable basis, considering the situation as "domestic" and not the type of house.

Of all the evil domestic tariffs, I personally prefer the block or sliding scale tariff on account of its simplicity. It is easily understood by all. It is inexpensive to administer, and it is in trend with modern business practise, i.e. the larger the quantity, the less you pay. But, I will be the last to criticise an Engineer for adopting the room basis method.

Even if these reasons are not sufficient may I then offer this colourful reason, i.e. the scope it gives the Electrical Engineer in its infinite variety. It does afford one the opportunity in partaking in mathematical and financial juggling with a variety of blocks at a variety of charges. This in itself is a charm, and allows one to show ingenuity!!!

What really is of importance to the local authority is the revenue received, and who can better judge than the local authority itself. As a novel idea and probably more scientific than the others, may I offer the following as an equitable demand charge method:-

A demand charge can be levied on the size of miniature circuit breaker installed. If a consumer requires or wishes to have a larger circuit breaker, he will have to pay more. The consumer will then pay for what he receives. This method is inexpensive and in my opinion equitable. It should therefore receive more consideration.

The author has not mentioned the sub-economic tariff offered to consumers by many local authorities in the form of a "heating or cooking" tariff. This to my mind is a most dangerous practice (economically) as with our industrial load growth of today, this heating and cooking

load may contribute largely to the actual maximum demand. I would like to hear the author's views on this.

In conclusion, Mr. President, I have great pleasure in seconding the vote of thanks to the author for this most valuable contribution. It will be a strong force of argument in persuading Councilors to make a change for the better.

Mr. A. R. SIBSON (Bulawayo): Mr. President and gentlemen, Mr. Pulik has, I think, by your common consent, presented us with an extremely valuable paper.

I consider the most important part of this paper is the stress that he places upon the need to ascertain the true facts of supply costs. What you do with the facts afterwards is a matter of individual policy; but I do submit that he is dead right when he presses for an accurate survey of the costs of the different classes of supply. Where I do disagree with him in his emphasis—and that of some of the subsequent speakers on his paper—on the need to arrange Tariffs in such a manner that revenue from each class of supply completely covers the cost of such class of supply.

Now, I think it will be remembered, certainly by the older members of the Association, how municipal electricity Tariffs came into being. It will be recalled that, over the years, and particularly during the earlier years of electricity supply, there was the custom of charging higher rates for lighting purposes than for heating purposes. I do not want to go into past history, but there are certain reasons why this came about, and those reasons still have a certain amount of justification today.

Broadly speaking, the commercial community, which makes such a great deal of use of power for lighting purposes, are really the same people—they and their employees—who, to a large extent, go home at night and have their baths; and you can charge these people a high rate for lighting which they can very easily bear, because almost any charge that you care to make per unit for lighting purposes will still be vastly less than the cost of any other sort of illumination that could be obtained. No serious hardship results from charging very high rates for lighting to anybody; but the charges for domestic supply, which is

very largely cooking and water-heating, today, if made at the actual costs of supply as ascertained in the manner Mr. Pulik suggests in the earlier part of his paper, would be quite prohibitive if they were really honestly applied. The only thing that has enabled us to encourage the domestic consumer to make use of all the amenities that electricity has made available to him—the only things that have made that possible are largely the sub-economic Tariffs that have been introduced for domestic supplies, and these have only been possible because of the supra economic Tariffs that have applied in respect of the same people in their capacity as commercial employers and employees.

Now, I suggest that, before this very useful differentiation is put on one side, you ought to give very careful thought to its implications because, if you do what Mr. Pulik has suggested and really make a careful analysis of the costs of each supply, you will find that the cost of supplying domestic consumers is very high indeed; they have not got a very good load factor, and you will find that the cost of supply to such consumers is probably in excess of the cost of supplying a shop for its window lighting or its office lighting. That is the first point I want to make.

The second is, it is also in respect of the application of ascertained costs. Mr. Pulik has pointed out that the coincidence of maximum demand is an important factor, and of course it is. Theoretically, if all consumers came on at the same time then all of them would share equally the costs of meeting the peak load through the maximum demand portion of their Tariffs or any substitute therefore which you might make.

I suggest that, in the vast majority of cases, the incidence of the peak loads in relation to the individual peak loads of consumers is quite fortuitous. In many cases it would be, from an electrical point of view, reasonable to say that if a consumer was prepared to do all his cooking at 2 o'clock in the morning, he would get a reduced tariff, but it would not be a practical sort of suggestion and would not meet with a great deal of communal approval.

To take an extreme case, imagine two newspapers, one printing its copies in the morning and one going to press in the evening; now it just so happens that the maximum demand that would be imposed might well take place, in the first case, at a time when there was no appreciable load on the system and, in the second case, coincident with the system peak load. Now, would it be reasonable, from a communal point of view, to say to the paper that did all its work in the early hours of the morning "You can have your power for about a third of a penny, or less," and to the paper that did its printing during the evening peak, "It is going to cost you 1.3d. or 1.4d. per unit?" Even though it is perfectly correct scientifically, is it communally reasonable? I suggest it is not. Although that is an extreme case, it is a typical example of what I am trying to get at. I suggest that a much better way of arriving at the share that each consumer should pay towards maximum demand would be to take all their maximum demands at whatever time of the day they occur and add them all together and produce a hypothetical maximum demand, which would be very much greater than any actual demand ever recorded, but which, in effect, would be the sum of the use being made by the various consumers of the facilities that are available to them, irrespective of time; and then apportion out the costs *pro rata* to each person's use. Now, this is all right from the communal point of view, but, of course, it is not satisfactory from the electrical engineer's point of view, because that would mean that there would be no inducement to anybody to try and fill up the valleys. That is the second consideration which has to be thought out, and there are several classes of consumer which can, without any embarrassment to themselves, be persuaded to change the incidence of their peak. Mr. Mitchell in his paper has suggested one class. I suggest that you would find quite a few more who, without any trouble whatever and without attempting to change their habits, could alter their load incidence and so make some improvement in the load factor.

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I think we must, Mr. President, bear in mind not only the pure economics of our own affairs but realize our communal responsibilities as well.

There is only one other thing I want to say, and that is that, in my view, the service charge is a bad psychological proposition; that the average consumer does not like paying a lump sum of money for no apparent return; he would be just as likely to object if he went to the grocer and was told that he would have to pay £2 a month for the privilege of dealing with that particular grocer, and that thereafter he would pay Tariff rates for whatever goods he was purchasing. I do think that the service charge is a bad psychological thing; I have never found consumers happy about paying for something that they are only too prone to allege they are not getting; and it is very difficult to prove to them that they are getting anything unless it is recorded in terms of units on their meter.

Mr. J. C. DOWNEY (Springs): Mr. President and gentlemen, Mr. Pulik is to be congratulated upon the subject chosen for his address to the Association. The basic principles he has stated should lead to a better understanding by our members of the factors entering into the design of modern tariffs. I should like to comment upon a number of aspects raised in the order in which they have been introduced in Mr. Pulik's address.

While the accumulation of data by an undertaking is desirable it should not be assumed the centralisation of data of necessity supports the desirability of a simple common design of tariff for every undertaking. It must be borne in mind a tariff suitable for an extremely small undertaking might be quite incorrect for a larger one. An undertaking passes through stages, each of which necessitates a different form of charging which will be obvious if the factors mentioned by the author are studied. The diversity which obtains in the case of a large undertaking, say, in the domestic group of consumers, is very different from that likely to obtain in a smaller undertaking. The imposed demand of two or three large industries in a small town, say the local mill and the S.A.R. and H., will have an effect

very different from the group demand of consumers of the industrial class in Johannesburg. The character of the inhabitants and the situation of the town must be studied. The differences between the incidence of loading of towns on the eastern and western seaboard must be realized. It is my opinion members should realize the desirability of a regular revision of electricity tariffs. This requirement is in fact imposed by law but in most cases is rarely observed. There are many other reasons why standard tariffs cannot be introduced though I support the author's view which I infer from Paragraph 1.0 that the general framework should be reasonably similar throughout the Union. My point is that data accumulated from many sources must be viewed objectively before it is applied to some particular town.

The author rightly points out that the basic requirements of a tariff structure should commence by maintaining sufficient income to meet the expenditure and, if possible, to produce a profit. In order to do so the author points out later on how necessary it is to have a profit sufficient not only for the needs of the undertaking but designed so that periodic increases in capital charges upon the outlay for major plant or distribution network extensions do not necessitate an immediate increase in tariffs. The power plant capacity is usually increased at intervals of about 5 years and the distribution network at intervals of 5 to 7 years requires major additions of plant and equipment. The annual recurring capital charges for interest and redemption of loans raised for these purposes increase the annual expenditure at these intervals by an amount large compared with the average annual expenditure for the preceding years. The annual expenditure of an undertaking upon which the tariff structure is framed must therefore take into account the crests in the curve of expenditure over a period and not merely the expenditure in one particular year. Between crests there will naturally be a substantial profit which might be appropriated in the manner suggested by Mr. Pulik. My point to you is, therefore, that the annual expenditure which a particular set of tariffs is intended to cover must be estimated with care. The

highest expenditure in the cycle mentioned of 5 to 7 years should be used as the basis for the design.

The author proceeds to elaborate upon the amount of profit which should be earned by an undertaking. It is my opinion no undertaking should operate without earning a profit. Our whole economic system is built upon the profit motive. I know of no better yardstick by which the efficiency of a business can be measured. Moreover there must be profits, as mentioned earlier, if the tariff is designed so that the crests of the annual expenditure upon the operation of the undertaking are to be exceeded by the income from sales. There is nothing that I know in any definition of profits which entitles the individual to look at it as something contrary to the welfare of any society.

I cannot, however accept the author's contention that the proportion of the profits appropriated for the relief of rates should be in the nature of a proportion of the capital invested in the electricity undertaking or a percentage of the annual turnover. In my opinion, the amount allocated to the general fund should be decided by the local authority after full consideration of all aspects related to the financing of a town's activities. In small towns having an essentially industrial character many of the non-measurable services carried on by the local authority involve expenditure which is the direct result of the existence in or just outside the town of these industries. Other towns are situated adjacent to mines and have to provide amenities for the mining development within the environs of the local authority's area of jurisdiction. In others, such as Vereeniging, large industries are located on its boundaries drawing supplies from the E.S.C. Much of the expenditure incurred in these towns for the benefit of the employees of such industrial concerns cannot be recovered through the ordinary mechanisms open to the local authority by way of rates upon improvements and land. Mining development is non-rateable and Government property is non-rateable. In order to recover the outlay by the local authority electricity profits must be appropriated for the purpose in addition to profits upon other measurable services such as water, sewerage, etc. It is my

opinion each case must be treated on its merits because there is no method I know enabling an undertaking to follow some stated rule, such as that put forward by the author. There is no relation in the matter of profit appropriation to the factors he suggests.

The author sets out an axiom that equity between consumers should be related to the cost of supply and that discrimination between consumers similarly situated should be avoided. Later in his paper he proceeds to classify consumers into three groups, namely, Residential, Industrial and Business. While a generalisation can be accepted with reservation it should be avoided if there is any possibility the statement has to be applied without qualification. In the Springs area one portion of the township which, in effect, forms a township on its own, consists of 1,362 domestic consumers. The average demand per consumer in the area during a period tested was 1.56 kVA and the units consumed per month 398. The demand in kVA per acre was 4.29. Another area wherein consumers falling within a lower income group are resident had 998 consumers. The average demand per consumer was 0.75 kVA, the average units consumed per month 201, the average demand per acre 4.4 kVA. An area occupied entirely by Railway employees numbering 75 gave on test an average kVA demand of 0.73 and 201 units per month. The demand per acre was 1.95 kVA. I mention these figures to illustrate that the differentiation which can be applied to various income groups of domestic consumers by means of a single tariff for domestic supplies can be great. In other words, simplifying tariffs to the limit can involve considerable discrimination and, possibly, introduce the dangers mentioned by the author in Paragraph 2, wherein he states that the tariff should not include sub-economic charges. Averaging of the demand of the industrial user can be extremely dangerous if as a result of the charges levied consumers having a potentially high demand are encouraged to apply for additional facilities, thus introducing a radical change to the average upon which the rates have been calculated. In other words, be careful in designing tariffs to ensure a proper understanding of mean and average results. In the framing of

domestic tariffs in the past encouragement has been given to a greater use of electricity in many towns overlooking the effect introduced when a far larger number of users having a big demand are connected. The resulting mean cost of production is consequently higher, not lower, so that the tariff offered as an inducement is in effect uneconomic. Many small towns have tariffs which on this ground contravene sound financial principles.

The author draws attention to the fact that a consumer's monthly bill should not be affected by his situation in relation to a substation. You are all aware that the determination of the cost of supply to any user is based upon averages involving a wide variation from the resulting mean. A consumer near the substation or power station of a common type enjoys the same charge as one at the remote end of the network. In framing a charge in this manner, the diversity which exists between consumers of a common group is enjoyed by the group as a whole. In effect, therefore, the attempts to obtain a high degree of accuracy in metering do not appear to be based on a valid reason if it is done at a high price. Because of the use of this averaging of cost of production to users I see no reason why a commercial meter of the ampere demand type should not be introduced, even if the accuracy exceeds  $\pm$  or  $-2\frac{1}{2}$  per cent. Here again, the average result should be reasonably close to the objective having in mind always that the rate calculated per unit of demand is based upon a very much wider range of accuracy.

In the classification of consumers it is in my opinion care should be exercised to avoid over-simplification. In an extremely small town it is probable there will be one or two very large consumers of the industrial class and a much larger number of small consumers. It would not be equitable to have a simple averaged rate of any particular design to cover the range. The numbers in any population using statistical language should be carefully considered in the framing of scales. Moreover, if a tariff is to be changed radically from some existing method, great care should be exercised to reduce the cases of hardship which might arise.

The allocation of costs to groups of consumers, as stated by the author, is dealt with very clearly and ably in the references quoted. The work of most use, in my opinion, is the designer of electricity tariffs is the 'Analysis of the Load of a Modern Electricity Supply System and the Improved Method of Allocating to Classes of Consumers the Demand Related Portion of the Standing Costs of Electricity Supply' in the E.R.A. technical report K/T. 109. The allocation of the cost of production of electricity to groups of consumers is one involving a great deal of judgement on the part of the designer and, if possible, a proper understanding of the operation of a local authority's activities and statistical methods. It warrants a study not only of the operation of the electricity undertaking but of the Treasury and possibly also other departments. The author, in my opinion, rightly stresses the administrative costs which may be introduced by the selection of a particular tariff design. In a small undertaking the simpler the design, the better, even at the price of a loss in strict accuracy of allocation of the cost of production to members of a group. The author points out in Paragraph 6 tariff designs take several forms.

The designer, in my opinion, must take cognisance of the conditions which apply to a particular undertaking rather than to a generalization that any one form has universal merit. As Engineers we should be on our guard always to avoid generalizations that a particular design has merit in every instance.

In regard to the residential tariff the author commences by making a bold statement that any form of demand tariff is impractical because there is still no demand meter available with a price comparable with that of the single phase kilowatt-hour meter. I cannot agree with his statement. In my opinion the thermal ampere demand meter is reasonably priced and can be used to advantage. I shall endeavour to demonstrate that this is so in all cases where the domestic user has a demand which justifies its installation. You will recall from my earlier remarks there are areas in Springs where the residents are essentially of the low income group and have demands which average only 0.75 kVA. In my opinion, such areas do not justify the installation of

a demand meter. The average number of units used per month is about 150 to 200. In other areas, however, where the consumption exceeds about 300 kilowatthours, demands are very much higher. Tests taken illustrate that the demand of users varies considerably and there appears to be no apparent ratio between the average monthly consumption and the maximum demand registered. The following figures illustrate my point: -

Consumer	Maximum demand in kW's over 20 minutes	Average monthly consumption	Actual monthly consumption
A	4.6	450	430
B	5.29	400	215
C	4.37	500	300
D	2.9	500	500
E	6.3	640	640
F	6.2	862	465
G	5.1	870	870
H	7.5	800	540
I	5.2	580	400

The above are results for a summer month.

A tariff which attempts to recover part of the demand related expenditure by means of a higher energy charge or secondary rate would fail to achieve the object of equitable treatment. In other tests at Springs a consumer having a demand of 32.5 kilowatts, which I admit is an exceptionally high demand, was found. In my opinion it is obvious if the domestic user continues to increase his demand at the present rate it will be absolutely necessary to install demand meters even if it is done at the price of a small loss in accuracy in the registration of the demand. It is no use, in my opinion, attempting to play with the danger by installing any form of demand limitation of particular types of appliances if the main culprit is some or all appliances. The installation of a thermal ampere demand meter, in my opinion, offers a ready solution to the problem. I do not subscribe to the view that the average intelligence of South African consumers is so low that given a measure of education the use of a demand meter could not be put over with advantage to both user and producer. The author decries the method of assessing the initial charge,

that is, the demand related allocation, on the basis of the Municipal valuation of property. In my opinion, if any arbitrary factor is to be used, the use of valuation is likely to be far more equitable than any other possible method.

As you all know, the larger Municipalities carry in the Treasury an internal audit department whose function it is to verify the arithmetical accuracy of the accounts of the department and also the origin of authority for expenditure. The Provincial auditors carry out similar duties. In the case of tariffs based upon factors introducing the number of rooms or the installed horsepower of premises the audit commences by assuming the accuracy of the basic demand related charges so derived. Very rarely and very infrequently are checks taken of the number of rooms or the installed horsepower by the Engineers of the department. It is illogical, in my opinion, to have an expensive internal audit or an external audit to verify arithmetical accuracies if the prime document is not checked to its source. The drawback mentioned by the author that valuations change is in fact, in my opinion, an advantage because it compels the local authority to review tariffs. Too frequently authorities maintain tariffs in force far longer than conditions warrant. The characteristics of individuals in common groups and the number in the groups, and hence the diversity ratios, change. As stated earlier, the statutory regulation compels undertakings to review tariffs at intervals of 7 years.

If any arbitrary factor is to be used, rather than introduce a room basis it is my opinion it would be better to use the author's alternative of block averages related to the demand cost of production which is an average for all members of a common group. You will have noted from my earlier remarks regarding the demands in various areas of Springs the room basis would present a most inequitable result. In some areas the poorer class predominates and the numbers of rooms in premises vary over the complete range from 2 to 7 or 8 rooms despite the low valuation of the premises and the low demands and monthly consumptions. In other areas the range of rooms is equally wide but the demands and consumptions are very much greater.

One remedy which has been proposed to meet this objection is to use a secondary rate 3 or 4 times as great as the energy cost of production as defined by the author. In my opinion, from the statistics compiled by my department, there appears to be no common ratio between monthly consumption in units and the actual maximum demand in kilowatts. Demands as low as 2.9 kilowatts are associated with an average monthly consumption of 500 units and demands of 7.5 kilowatts with approximately the same consumption.

The valuation of premises is readily available in the records of the Municipality and is open to check and access by Provincial auditors. It would appear from an analysis of consumers the demand of a user is more nearly in proportion to his income than to the number of rooms in the premises he occupies. The valuation of the premises in which a member of the high income group resides is far nearer his income and hence an arbitrary factor related to his demand than the number of rooms. I would suggest, however, it is my opinion rather than use any such factor for the users having a high demand, it would be better to introduce demand metering. I do not wish to trespass upon the subject of my friend, Mr. Mitchell's, paper on 'Ripple Control' wherein he stresses the value of saving demand of users. The value is high, in my opinion, that long before the bill reaches £25, which is the limit set by the Johannesburg Municipal undertaking, it is economic to install some form of demand metering. I agree the installation of a demand meter may seem a high price if only the outlay on its provision, testing, and administration are taken into account. It must not be overlooked that the object is also to reduce the outlay upon plant and distribution equipment and that one kilowatt saved probably reduces the capital outlay of an undertaking today by about £200.

The author, in my opinion, follows the correct course in rejecting the use of the installed capacity of an industrial user as a form of assessment of his likely demand. It is my opinion the use of a thermal ampere demand meter might be an even better solution than the suggestion put forward by the author which is the use of a block tariff with a fixed initial block designed to bring in the average

demand related expenditure incurred in giving a supply to small industrial users. Having in mind the large range in the cost of production to all industrial users situated at various distances from the source of production and distribution, it is my opinion the lower accuracy of the ampere demand meter is completely justified because it is likely to produce a result much closer than the averaging of demands of users in this group.

Mr. C. KINSMAN (Durban): Mr. President and gentlemen, I fear that some of my colleagues are prone to accept the abnormal conditions prevailing in recent years as normal conditions for the future. The colossal armament and re-armament programmes of the past dozen years have inevitably entailed shortages of plant and delays in the delivery of new plant with the resultant necessity for restrictions in the supply of electricity.

Let us not, however, plan our policies as though such things are normal. Rather let us look to the future with optimism and with consideration for the interests and rights of our consumers. Let us direct our thoughts and energies towards the attainment of that happy position when a consumer will be able to have all the electricity he wants—when he wants it—provided he is prepared to pay for it.

As engineers our task should be to devise means whereby consumers will be called upon to pay equitably according to their usage, i.e. according to their load factor and their demand at the time of the system peak.

Two promising suggestions have been made during the discussion. I refer to the possible development of a reasonably priced ampere-demand meter and to the use of dual meters whereby a consumer is charged at a higher rate per unit when his demand exceeds a pre-determined figure.

Previous speakers have stressed the savings which will result from the control of water heaters but they have not told us what will happen to the savings. In all probability they will be appropriated in relief of rates. If, however, they are directed to the reduction of tariffs, I fear that the distribution will be inequitable. I say this having in mind two types of domestic consumer, viz.:-

- (a) The consumer whose appliances are

limited to an electric range, water heater, kettle, toaster and iron.

- (b) The consumer, who, in addition has 5 kW of electric radiators.

Each of these consumers will have contributed equally to the saving due to water heater control and yet, under the the conventional domestic tariff scales, consumer (b), with his higher consumption, will derive the greater financial benefit from a tariff reduction despite the fact that he has imposed a much higher demand than consumer (a) by the use of electric radiators.

Mr. C. G. DOWNIE (Cape Town): Mr. President, ladies and gentlemen, Mr. Pulik's paper on the basic principles of the construction of electricity tariffs is particularly welcome coming as it does at a time when all electricity undertakings in South Africa are faced with the need to increase the tariff rates to meet the rising cost of production. The paper will, I hope, serve to impress upon those responsible for tariff making that it is not an easy matter and not merely a case of charging what the traffic will bear.

I heartily agree with Mr. Pulik's remarks regarding electricity profits and would like to see a tariffs stabilization fund established in Cape Town also where, as you probably know, all electricity surpluses have for many years been taken over for the benefit of the ratepayers. Prior to 1944 part of the surplus was ploughed back into the undertaking but since only small token amounts have been set aside apart from a special reserve fund for the Table Bay Power Station.

With regard to Mr. Pulik's remarks on discrimination between groups of consumers, I am afraid that this practice will persist. I have recently had experience of this in Cape Town where the business consumers mentioned by Mr. Pulik were heavily penalized by steep increases in the tariff rates while the domestic consumer who, in Cape Town, is mainly responsible for the peak is not bearing his fair share of the demand costs.

An allocation of costs similar to that described by Mr. Pulik was recently carried out in Cape Town also and I can agree with Mr. Pulik's statement that the allocation of the demand costs is the most difficult part of the work. The allocation depends largely upon the load

factors of the various groups of consumers and I would be interested to learn whether in the Johannesburg investigation the group factors, or what amounts to the same thing, the group demands, were determined as a result of sample surveys or what other method was adopted.

I am also interested to note that Mr. Pulik bases his classification of tariff rates on consumer groups. This is in accordance with modern practice and is in contrast with the classification adopted in the early days of the electricity supply industry when tariff rates were classified according to end uses, e.g. lighting, power, cooking, heating, etc. This, of course, is a natural development from the days when electricity was used for lighting only and later for power and other purposes. Today many undertakings use a mixture of the two methods of classification which I think is undesirable.

On the question of residential tariff rates I am inclined to agree with Mr. Pulik that a variable initial block rate would give a consumer no ground for complaints of being charged for electricity which he has not used. Am I correct in assuming that Mr. Pulik does not advocate a minimum charge and that a consumer who is absent on say a three-month holiday would pay nothing for three months even though meter reading and other costs continue?

In connection with tariff rates for business premises Mr. Pulik suggests the simple fixed block tariff. Has he considered the variable block rate based on floor area for this type of consumer as a means of encouraging better lighting and therefore increased consumption?

In conclusion I would like to congratulate Mr. Pulik on his excellent paper on a very controversial subject which, while it may be familiar to most engineers, is certainly very much of a mystery to Councillors. The latter would do well to give the paper a close study.

Mr. E. L. SMITH (Boksburg): Mr. President, and gentlemen, I wish to congratulate the author on a very interesting paper which will no doubt raise a lot of discussion. The subject is a very controversial one, one which has been raised many times not only in this Association but in others, but nevertheless it is a subject which should be intro-



duced from time to time, because of the great changes taking place in the electricity supply industry.

The time is fast approaching, if it is not here already, for Engineers and Councils to make a completely new approach to the question of tariffs. The old factors which governed tariff structure with regard to certain class of consumers have disappeared. The Hon. Dr. Nicol the Administrator said when opening this convention "that electricity is essential for the well being of the farming community." If that is so, then electricity is no longer a luxury but it is an essential factor in the every day life of the people of South Africa. Therefore it should be treated as such and charged accordingly. With the great increase of consumption per head of domestic consumer, together with the modern way of life the "room system" no longer gives a true indication of demand, whether electricity is used for lighting, heating or cooking, it costs the same to produce, and electric lighting is now a small proportion of the total consumption. A single room flat with a small kitchenette uses more electricity than most large houses. A survey which we are carrying out shows that the size of the house no longer bears a true relation to demand. The disadvantages of the room system is that records have to be kept by both the Electricity and Treasury departments, and inspectors employed to keep a check on the number of rooms a house may have.

Boksburg changed from the room system of charging to the fixed block tariff, there was no loss in revenue, everyone was satisfied, the owners of large houses were happy to know that they were not subsidizing the electricity supply to owners of small houses, and the Council's departments were relieved from a lot of unnecessary work. A comparison between the domestic tariff of Boksburg and Johannesburg will show that there is no over-charging of the small consumer at the expense of the larger, as stated by Mr. Milton.

The Town Council of Boksburg do not favour bulk supply to flats, they treat every flat as a separate domestic consumer. This system prevents abuses, provides extra revenue, and simplifies the application of the meter testing code.

If there is to be no discrimination between various classes of consumers I would like to suggest for consideration a tariff for all consumers of electricity.

- (a) For all bulk supplies a K.V.A. demand charge, plus a unit charge.
- (b) For all other consumers an ampere demand charge, plus a sliding scale unit charge.

In other words, for the same consumption of electricity, the cost to all consumers would be the same. I feel that if such a tariff could be introduced manufacturers would design a meter which would incorporate the ampere demand, the cost would not be great but the achievement of uniformity of tariffs would be a great step forward.

Mr. D. D. BROWN (Roodepoort-Maraisburg): Mr. President and gentlemen, so far as the Electricity Tariffs are concerned, I am particularly interested in these on account of the fact that, for the past two years, my Council have experienced considerable difficulty in procuring promulgation of Tariffs, on account of the fact that the form of the Tariffs does not meet with approval. Up to the present, we have been used to having our Tariff based entirely on room basis and horse-power charges, and that applies to domestic, business and industrial consumers; they all have to be assessed on room basis and horse-power, with the result that in our area the consumer sees that we have to go out and re-assess his premises practically, and it is a very, very expensive proposition; we have been trying to eliminate that.

Now, on the advice of the Electricity Supply Commission, the Provincial Administration has been constantly rejecting our Tariff because they maintain that we should adhere to room basis and horse-power charges. We wish to substitute sliding scales.

So, as I have said, I am very keen on this subject, and it is with great pleasure that I take this opportunity of contributing to a discussion on this stimulating and provocative subject—and also adding, of course, my meagre of praise to the author for his very interesting and useful paper.

At the outset, Mr. President, I wish to warmly welcome the suggestion by Mr. Pulik regarding the formation by this Association of a Committee to make

recommendations on Tariffs. The appointment of such a Committee would make available to the Administrator a truly representative source of information and advice, and would presumably go a long way towards eliminating what I can only describe as the present unwarranted and unwelcome control exercised by the Commission over Local Authorities and Tariffs in the Transvaal Province.

To deal more specifically with the paper, I notice with interest that Mr. Pulik expresses the opinion that the room basis expressly relates to consumers' demands. Now, I have heard that opinion very often expressed in the past; and very rarely are any substantiating facts or statistics given to support that expression. I have asked this question often before, on hearing that expression of opinion, and once again I ask, very simply and ingenuously, why does the room basis expressly relate to the consumers' demand? In this paper, I cannot see a reply to that question.

It may interest Mr. Pulik to know that in Roodepoort, on account of this dispute, we have gone very deeply into the subject; and I have drawn up a sliding scale for Roodepoort which applies literally to thousands of our consumers—applying to the monthly accounts, and this reveals that identical revenue would be obtained from individual consumers should these scales be substituted for the existing room basis; in other words, by using a sliding scale, in individual cases we would obtain identical revenue. That being so, I fail to see how a room basis can be preferred to the sliding scale on the demand basis. If the consumer pays £1 per 300 units per month, on a sliding scale, and he pays £1 per 300 units on a room basis, well, it is quite obvious that there is no difference between the two methods, except, of course, that the sliding scale is very much simpler; it obviates all the assessments and administrative costs, and so on.

So that leads to my first question to Mr. Pulik: In the event that practically identical revenue is obtained from individual consumers by means of a fixed sliding scale, is Mr. Pulik of the opinion that the expense involved in applying a room basis is system justified?

This question of room basis, as I have said, has been very thoroughly investigated; and only one of the anomalies which is immediately apparent is this: if a domestic consumer wires his Native's room with a 60 watt lamp, he is required to pay a fixed charge of 2s. 6d. per month for that room; if, however, he scraps his coal stove and installs a 12 kilowatt electric stove, which he uses mostly during our morning and evening peak periods, there is no fixed charge applicable at all. In the circumstances, it is my opinion that it is not at all ethical to base a fixed charge on a number of rooms, because there is no relation whatever to installed loads, particularly in the modern electric home.

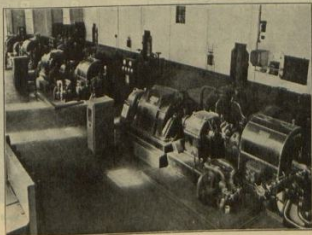
As a comparison, one may consider an all-electric flat with two living rooms, an installed load of 15 kilowatts, and a house with five living rooms and an installed lighting load of 1 kilowatt. Is it ethical that the former should have a fixed charge of 5s. per month, and the latter 12s. 6d.?

So far as industrial consumers are concerned, Mr. Pulik states that a tariff based on appliances installed should be applied in small industries. Well, I would warn any member who is contemplating such a system against it, because it is the most iniquitous form of tariff that can be inflicted on any innocent and unsuspecting Engineer.

May I ask if the individual industrial loads are too small to warrant maximum demand metering? Would not the normal diversity amongst this class of consumer obviate any necessity for charges based on installed load?; would a simple sliding scale not meet the case? If not, why charge a small industrial consumer on 10 horse-power of installed load, when a domestic consumer with 15 kilowatts of electrical appliances pays no fixed charges whatever for such appliances, particularly when a domestic consumer uses his appliances largely during the morning and evening peak periods?

Mr. Pulik has also submitted some statistics here regarding the tariff situation prevailing in Britain, and in that connection I would like to point out to Mr. Pulik that quite possibly the domestic and housing conditions in Britain have no or very little application in this country.

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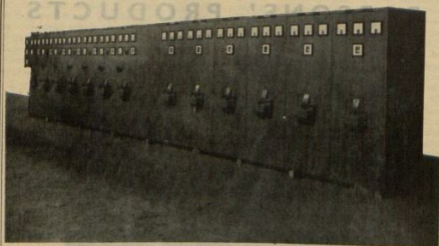
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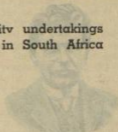
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In that respect, I would like to ask Mr. Pulik whether he has information as to the tariff methods used in Australia, New Zealand, Canada and America, where, domestic conditions are possibly more comparable with South Africa.

With those few words, Mr. President, I conclude my contribution to this paper; and I want again to express my gratitude to Mr. Pulik for a most useful and interesting paper. Thank you.

Mr. J. E. MITCHELL (Salisbury): Mr. President, I shall be very brief. I would like to thank Mr. Pulik for a very, very informative paper and one which sets out certainly all the guiding principles with which to formulate tariffs. I would, however, like to warn Engineers who think that they can actually formulate their final tariff on actual mathematical reasoning. I feel that they will never get equity in allocating cost to the actual consumer; they will find all sorts of difficulties which will not work out.

In that connection, I would just like to tell the Convention of a small incident which occurred to me many years ago when I was a District Manager with a large power company in the Old Country.

We used to have monthly meetings where the General Manager used to fire questions at us; and one day he asked us why we charged 2½d. per unit for the first thousand units, 2d. per unit for the next two thousand units, and so on, for the small industrial consumer. We went right through all the list which Mr. Pulik has given us to-day, including load factors, diversity, power factors, the lot; and, finally, when we had all gone round, the General Manager said: "Yes, gentlemen, that is very interesting, but you're all wrong. The reason why we charge 2½d. per unit for the first thousand, and so on, is because we can get it." (Laughter.) You must remember that that is, to a certain extent, a guiding principle; in other words, if you can supply something which it is cheaper to use than some other method, then you can sell it. Thank you, Mr. President.

Mr. V. E. O. BARRATT (Queenstown): Being a comparative country cousin to many of the larger undertakings, my

undertaking may, through me, have somewhat of a rustic outlook; consequently, we look to the root of things; and, when it comes to tariff design, we wonder and we try to find out just what the reason of the design is and on what it must be based. We look around for a simple simile, and we think of the farmer with his small lighting set; we think of the farmer with his larger lighting set; and we realise that the farmer with the small lighting set has to limit his demand for lighting to the amount of capital that he has expended in providing himself with a set capable, we will say, of 500 watts output; but the richer farmer who can expend more will have a 2½ kilowatt set, and he can spread himself in comparison with the first farmer. I think that the tariff has to be designed to cover those aspects; that is, the aspect of what you can afford and what you should pay for. So, by designing a tariff on maximum demand, the demand part saves the individual consumer from laying out a certain amount of capital. At the same time, through the fact that we can have instruments designed with varying time lags, we can give that farmer or that consumer a subsidy, through not demanding the full payment for the full capital that has had to be laid out for him.

Gentlemen, I am of opinion that ultimately all tariffs will be based on a demand plus energy charge.

Mr. F. STEVENS (Ladysmith): I have read with considerable interest the paper Mr. Pulik has submitted to this Conference. The subject is one which cannot help but interest Councillors as well as Engineers.

The emphasis Mr. Pulik puts on the point—that there should be no discrimination between consumers with the same load factor—I wholeheartedly agree with. Far too often does one hear it argued in connection with domestic tariffs that the fellow with the large house on the hill should pay the bigger minimum, without any regard to the load he imposes on the system.

I do not think, however, Mr. Pulik goes far enough when considering the application of a block tariff to domestic consumers (see top of page 11). I disagree

that they should pay a variable minimum according to the size or valuation of a house.

Today there is no direct relationship between the number of bricks and sheets of iron that go to build a house, to the electrical installation that may go into it.

As far as the cost of supply goes I think it can be accepted that, where there is a group of dwellings large and small, it increases with the load they impose on the system, and decreases according to the greater the number of units purchased.

I am fully aware that there are a hundred and one factors involved, but then what is theoretically correct is invariably departed from in the long run. The framing of tariffs boils down to this, that while discounts may be allowed where the demand for a commodity is big, even bigger discounts are possible when the supply can be spread over a period.

In considering the cases I have sited, if one deals with the connected load alone, the house with the fewer rooms or lower valuation should pay the bigger minimum, but then there is the load factor to be taken into account, and here we find that the average "all-electric" house has a load factor of about 45 per cent, while for some big houses with lights and plugs only, it is 35 per cent or less.

I am of the opinion that the fairest way for all concerned is to have a common minimum charge and apply the block tariff.

The Supply Authority should, I consider, determine the approximate overall ready-to-serve cost for supplying its domestic consumers, then divide this figure by the number of consumers to arrive at the minimum each must pay.

In conclusion, I would like to thank Mr. Pulik for his paper.

Thank you, Mr. President.

Mr. F. P. W. Hall (Somerset West): Mr. President, gentlemen, Municipal Engineers are often criticised by Domestic Consumers for not having a universal standard tariff throughout the Union, forgetting that the generating and distributing costs of electricity must vary from town to town.

This is particularly noticeable where a Domestic Consumer moves from a town with a large industrial load to a town

with no industrial load, an extremely heavy cooking and heating load and with an extremely low load factor.

Although the domestic two-part tariff based on the floor area of a house is logical, yet it is not popular, owing to the necessity to encroach on the privacy of a house. The block tariff, although unfair on the small user, is much better liked by consumers but the high priced part should not be called a "Service" charge since discontented consumers are likely to demand a definition of "Service" and this word should be substituted by the word "Minimum." I have already made the change of name in my own tariffs.

Another tariff difficult to enforce is the installed H. P. tariff and should be substituted by the maximum demand ampere charge if the use of an M.D. Ammeter in place of a costly Wattmeter, can be legalized.

Tariffs should also be allowed an automatic percentage increase in proportion to the annual increase in the cost of coal—which is regularly seen on Bulk Supply Accounts.

Mr. G. S. FAINSINGER (Windhoek): Mr. President, gentlemen, I would also like to thank the author for his valuable contribution to the study of electricity tariffs.

On the subject of domestic tariffs, the author states that "there is still no demand meter available at a price comparable with that of the standard single phase kWhr. meter."

While not disputing this statement, I would suggest that there are other equitable means of ensuring that the demand charge bears a direct relationship to the consumers actual demand.

In Windhoek for instance, we have been forced to adopt a system of rationing of electricity to domestic consumers by means of the installation of 15 amp. circuit breakers. As a result of our experience with these C.B.'s during the last nine months, I have come to the conclusion that a demand charge based on circuit breaker rating would be quite feasible, especially under the conditions which obtain in Windhoek.

This conclusion derives mainly from the following observations: -



1. The system peak load is appreciably reduced without a corresponding reduction in units sold. In our case, the average daily load factor increased from 58 per cent to 63 per cent after about half the domestic consumers had been dealt with.
2. After a week or two, the average housewife learns how to adjust her routine so as not to exceed the allowable maximum demand. There are cases of course where we have had to increase the rating; for example, cases of large capacity elements fitted to certain types of stoves and washing machines. So far these cases have been less than 1 per cent of the number connected.
3. It soon becomes habit for the housewife to switch off her geyser before starting to use the stove. This, information, I repeat, is the result of observation, and not wishful thinking.
4. As closely as I can judge from available figures, the reduction in after-diversity demand in Windhoek is 0.4 to 0.5 kW per domestic consumer per 15 amp. breaker installed.
5. Many consumers would be quite willing to retain 15 ampere breakers indefinitely if any reduction in account were allowed for doing so.
6. The average domestic consumer in Windhoek, were charged so much per ampere circuit breaker rating, would probably choose a rating between 20 and 25 amperes.
7. In spite of what has been said by the author about the consumer's difficulty in understanding the meaning of, and the reason for, kVA demand charges, I find that, when such terms are translated into practice, they soon take on a very real meaning. In heavily industrialized areas such as Johannesburg and environs, there is a relatively large proportion of consumers who will cause trouble by resisting new measures such as this, but even this resistance, I think, can be largely overcome by persistence in the application of necessary measures.
8. With regard to the circuit breakers themselves, these are all tested before installation, and we find that

5 per cent to 10 per cent of them have to be re-rated as there is little provision for adjustment.

Should they be used as a means of levying a charge, it would be a simple matter to label each one with its exact maximum sustained current rating, the testing procedure involving only a fraction of the work entailed in testing and calibrating ordinary single phase meters. In our case, practically no additional unproductive costs were involved since even prior to restrictions, we used 35 to 50 amp. circuit breakers as municipal cut-outs.

There is good reason to believe that the introduction of such a tariff would have the effect of improving the system load factor considerably. This can only mean a reduction in capital cost per unit sold and must therefore eventually benefit the domestic consumer through tariff reductions.

The type of tariff I have suggested is admittedly a restrictive type of tariff in the sense that the consumer is allowed to choose the degree of restriction imposed, and this fact would seem to constitute the main argument against it. Furthermore, there will be occasions when the consumer, should he choose a certain rating, will wish he had chosen a rating slightly higher. As far as such minor inconveniences are concerned, I feel that the time has arrived when engineers should view the matter with more regard to the broader issues involved. So far, our energies have been directed towards satisfying the consumer without, in my humble opinion, due consideration of the effect of our actions and decisions on such issues as national economy and conservation of fuel resources.

Discounting the possibility of future unlimited atomic power resources, I think that it is more important for us to make decisions which will favour overall efficiency and economy rather than the whims and fancies of our consumers. These whims and fancies are, I think, the result of what the psychologists would call environmental conditioning so that, if the environment be changed, the consumers will soon enough become conditioned to the new state of affairs.

I am informed that in the Scandinavian countries where hydraulic stations are the rule, the domestic tariff consists of a nominal annual charge equivalent to about £5, for which the consumer is allowed to use as much energy as he can get through a C.B. which limits his maximum demand to about 3,000 watts. This state of affairs I am told, is taken for granted, and appliances are manufactured to suit. The application of such a tariff throughout Southern Africa alone, I am sure, would result in a reduction in peak load equivalent to the capacity of generating plant costing many millions of pounds. The saving in fuel due to improved load factors would contribute materially towards fuel conservation on a national scale.

I think it is up to electrical engineers to give the lead in this matter, and not to feel so diffident about the immediate reaction of their consumers. It should not be necessary for us to wait for a national or international emergency before feeling justified in attempting to educate consumers to obvious requirements. Import controls, petrol rationing and financial restrictions are all accepted when necessary and I feel sure that, if the Union treasury realized how much could be saved in capital cost by the introduction of a few relatively minor restrictions, we would have far less freedom in choice of tariff than we now have.

There seems to be an impression current that the use of circuit breakers imposes undue hardship on consumers. It should be emphasized however, that the rating of the circuit breaker is entirely at the consumer's discretion. If he is willing to pay for a 100 amp breaker, there is, as far as the proposed tariff is concerned, no good reason why he should not have one.

My Council has approved in principle the adoption of a demand tariff such as I have described. I was therefore very gratified to hear the remarks of Messrs. Van der Walt and Smith who have made similar suggestions. I would very much appreciate the opinion of the author as well as engineers of other centres, about these remarks, and I would be particularly grateful for criticism which will enable me to take into account factors which I have possibly overlooked.

Mr. S. E. Irwin (Kimberley): I consider that Mr. Pulik has made a very valuable and comprehensive contribution to the literature on Electricity Tariffs.

There is one factor which it seems to be the practice to ignore when making a tariff, namely: "What the consumer will bear."

In the early days of electricity supply, it was considered a luxury service and that no one should use such a high-priced commodity as electricity unless he could afford to do so. Now, of course, all sections of the community find electricity indispensable.

A time-honoured and very important factor in the fixing of railway rates is "what the traffic will bear." Both railways and supply undertakings are similar, in so far that they perform public services, and it seems that more attention could be given to the question of the consumer's ability to pay, when fixing electricity tariffs. A Municipal Engineer may say that he is not concerned with this aspect, but as a member of a Municipality it is almost inevitable that this factor must enter into his calculations when framing a tariff.

One speaker inferred that the final acid test of a tariff was the willingness of the consumer to pay the charges. Surely this is another way of saying "What the consumer will bear." We all know that the perfect tariff does not exist. The problem is, of course, to find a tariff which approaches the ideal as nearly as possible. In order to do this, the question of ability to pay cannot be ignored. Perhaps one might say that the Engineer would be more happy to have a tariff which caused the least number of complaints from his consumers, than to have a theoretically perfect tariff (assuming such a perfect method of charging existed) which was not acceptable to a large number of his consumers. In other words to find a tariff which will cause the greatest satisfaction amongst the largest number of consumers. I cannot see how this can be accomplished without due regard being given to consumers ability to pay.

A consumer living in a sub-economic house may be quite satisfied to pay cost plus 30 per cent, one in a large house cost plus 60 per cent, both can be classed as remunerative consumers, but

the reverse seems to be the order of the day. The small consumers paying a high average cost per unit and the large consumers getting off very lightly.

The average cost per unit paid in a certain sub-economic Township with houses valued at £800 each, found to be about 2d. per unit. Large houses in the same town with high consumptions paying a little over 1d. per unit. The difference in the average cost per unit mentioned is because a large proportion of the small consumers' units are on the high rate of the two-part tariff. (Very few of these consumers take advantage of the low water heating rate of 4d. per unit.); but most large domestic consumers show a heavy consumption of these and other low priced units which are barely remunerative.

It is agreed that distribution costs are higher per unit sold for the small consumer, but not to such an extent as would justify the large difference in cost per unit indicated above.

Tests taken by charging on the room basis instead of the existing rateable value basis indicated a worse position rather than a better one. Most of these sub-economic dwellings have five rooms, whereas houses costing several times more, may have only 7 or 8 rooms chargeable on the room basis.

The obvious method in a two-part tariff of ensuring that the lower income consumer is not unfairly burdened, is to make the primary units cheaper, with increased price of the secondary units. Some such arrangement as the following would operate. Instead of the primary units being at 6d. and the secondary at 4d. the former would be at 3d. and the latter at 1d.

In the case of the room basis, the charge would be at say one shilling per room per month instead of two shillings with increased cost of units to compensate for the lower room charge. By this means the burden could be more evenly distributed among the consumers of all classes.

In order to more nearly approach the ideal method of metering, I feel that a great need exists for an inexpensive, combined ampere maximum demand and kilowatt hour meter to be evolved. Such an instrument would serve a double purpose, firstly to ensure that a consumer pays more closely in relation to the

amount of plant he requires at the Power Station to cover his requirements and secondly to act as an incentive to a consumer to reduce his peak load and thereby promote an all-round improvement in load factor.

Mr. H. J. GRIPPER (Port Elizabeth): Mr. President, gentlemen, Mr. Pulik has dealt with a vast subject in a very concise and interesting manner. And has sounded a timely warning regarding the inevitable increase in electricity charges albeit these are delayed for reasons peculiar to the business of Electricity Supply Undertakings.

I could not agree more with the author in his statement that any contribution to rates made from Electricity Profits should be a well defined amount either related to the capital invested in the undertaking or the annual turnover. At the best of times such contributions are not in my opinion justified but it is frustrating in the extreme when the profits of an Undertaking are collected in a manner which deprives the staff of that Undertaking of any sense of pride in their efforts on behalf of the Municipality concerned.

Although the author does not agree that a Tariff of Charges should be dependent in any way upon the voltage at which the consumer receives his supply I would plead that it is on occasions more convenient for the Supply Authority to make a supply available at a higher voltage and incidentally with less losses incurred, and, providing the alternative tariffs are available for selection by the consumer, the difference may be justified.

The load curves for different classes of consumer as given in Figs. (I), (II) and (III) are representative and instructive but I would point out the domestic load curve shown applies more particularly to a large city such as Johannesburg, Durban or Cape Town where the average domestic consumer partakes of his principal meal of the day in the evening. In many smaller centres the heavier cooking load occurs in the forenoon. Port Elizabeth is at present in the transition stage and more and more properties are being sold further away from the business centre preventing the average business man from going home for lunch during the working day.

Special reference is made to the lighting load from the business community but, apart from a sudden increase due to a cloud obscuring the sun there is a very considerable increase in load from these consumers due to the switching on of radiators on a cool morning. If central heating or all-night space heating could be encouraged in these premises much could be done to improve the system load factor.

I was particularly interested to note that according to Table (II) the proportion of demand in Johannesburg is roughly 62½ per cent Residential, 15½ per cent Business and 22 per cent Industrial. While it is appreciated that much of Johannesburg's industrial load is now carried by other Supply Undertakings, it is interesting to note that the residential consumer provides such a large proportion of the peak load of the Undertaking and bears out my contention that this class of consumer should pay more on the average for electricity although in many centres this is not the case, presumably because he holds the greater voting power for Municipal Councils.

I agree entirely with Mr. Pulik in his statement that a residential tariff should not be dependent upon ratable values which have little if anything to do with electricity supply but I would press for consideration of some type of basic charge dependent upon the size or capacity of the installation. A suitable H.R.C. fuse or miniature circuit breaker could be installed to determine the basic or fixed charge and this could be increased when required with a corresponding increase in the fixed or "availability" charge.

While one could continue almost indefinitely on this subject of electricity supply tariffs due to the extraordinarily wide variety which has been developed from time to time both in this Country and elsewhere, I would stress that, in my opinion, it is time that a basic or standard form of tariff at least for domestic and for business or Industrial consumers should be drawn up and used throughout the Union (or Southern Africa) as a guide for Supply Undertakings to base their ideas upon as and when they contemplate changes in their existing tariff structures.

#### Mr. G. PULIK'S REPLY TO DISCUSSIONS ON HIS PAPER.

In reply to the discussion I want to thank the various contributors for their kind remarks. My paper quite justly also provoked a considerable amount of criticism, which brought out a number of points that were not covered, partly because of the necessarily limited compass of such a paper and partly because I was inclined to look at things from the point of view of a large undertaking such as Johannesburg, and have consequently lost sight of certain facets applicable to smaller communities. Many of the points raised would in themselves form the subjects of lengthy discussion, and for that reason and because of the necessity to conserve space, I propose apart from replying to a few queries, rather to summarise the discussion, than to attempt to give a full reply.

I agree with Mr. Milton in his criticism of the peak responsibility method of allocating demand related costs, but I disagree with the suggestion offered by Mr. Sibson. Both these methods and several others are discussed in the E.R.A. report quoted in my paper. The improved method advocated in this report, to my mind avoids the pitfalls mentioned, and takes into account the requirements of developing undertakings as explained by Mr. Milton.

I find it difficult, to follow Mr. Milton when he explains, that in certain circumstances the unit charge may be fixed below the production cost. It seems to me safer, unless the contrary procedure can be proved to be justifiable under well defined circumstances, that the costs of each supply as far as it is possible to ascertain them shall at least be covered by the charges.

While admitting Mr. Milton's contention, that a service charge is theoretically correct, and a minimum charge covering the initial block of high priced units is a subterfuge, which but thinly disguises the service charge, I would like to put it to him that an initial block of high priced units without a minimum charge does not involve an undertaking of any appreciable loss of revenue on one hand, and on the other meets automatically the care of the very small consumer for whom he advocates the alternative optional flat rate. This results in a tariff form which

adapts itself to a variety of conditions, and avoids unnecessary multiplication of tariff scales.

I did not wish to be dogmatic in my paper about the lower limits of application of demand metering and I feel with Mr. Milton, that there are other than economic factors to be considered, when determining this limit. Generally speaking I think with many of the contributors, that a maximum demand tariff for all consumers would be the most equitable. A single-phase kilowatt hour meter with a built-in thermal demand indicator is now being marketed in the United States at a reasonable price by their standards. When such a meter becomes available in this country at a reasonable figure, I have no doubt that many supply authorities will turn increasingly to demand tariffs. In the meantime I would be loath to agree to any of the expedients suggested by various contributors, such as ampere maximum demand meters and tariffs based on the setting of a circuit breaker loadlimiter, especially in a large undertaking such as Johannesburg, though these expedients seem to have attractive possibilities to smaller undertakings.

I stated in my paper that Johannesburg is taking the view that it is not practicable to meter the demand where the consumer's account is less than £25 per month. Though this figure is possibly rather on the high side it must be pointed out that three-phase kVA demand metering costs at today's prices would exceed 1 per cent of the monthly account at this level.

Though most contributors seemed to express the opinion that the most equitable way of charging for electricity is by way of the demand tariff, there seemed to be considerable amount of disagreement how to treat consumers for whom at present demand metering equipment is too expensive to instal. In the case of domestic consumers a body of opinion is inclining towards the simplicity of the block tariff as against two-part tariffs related to room basis for instance.

Though of course it is possible to construct a block tariff or any other form of tariff (say a flat rate) to obtain a given revenue from a group of consumers, a block tariff shares with the flat rate the disadvantage, that it treats all consumers exactly alike, in that it does not introduce any differentiation in respect of the

magnitude of service. One cannot reiterate often enough that the value of electricity supply cannot be measured only by the number of units supplied, but that it is primarily a service, which is measurable as demand. But should the actual measurement of demand be not practicable for economic or other reasons, this is not a logical argument for dispensing with measurement altogether, even if this measurement is related to a somewhat arbitrary scale such as the number of rooms or floor area.

Mr. Brown has made the interesting statement that the block tariff can be constructed to give the identical revenue as the room basis tariff not only from all the domestic consumers as a whole, but also from each individual consumer. It would be interesting to study his figures, as my attempt to verify his statement from Johannesburg's statistics available to me, have failed.

Mr. Brown is a strong protagonist of the sliding scale tariff. However, he fails to my mind to make a case for it. In fact one could use his arguments for instance with equal success in favour of a flat rate tariff, which while it shares all its disadvantages with a sliding scale has in fact the added advantage of utter simplicity. His case rests mainly on certain criticisms of the room basis tariff which are justified, and which are in fact by no means complete. On one hand he apparently recognizes the necessity of a two-part tariff incorporating demand and unit charges. On the other he seems to take the view, that such a tariff should either be based on measured demand or should not be attempted at all. I would put it to him that the room basis tariff, while capable of being improved, is nevertheless a step towards an equitable tariff, which is still considerably cheaper than metered demand and more equitable than either sliding scale or flat rate. I regret that I am unable to reply to Mr. Brown in regard to tariff practice overseas, but shall endeavour to make these data available in due course to the Association. As far as industrial and business consumers are concerned, I want to dispel the impression that I am committed to sliding scales. In the case of industrial consumers, I am convinced that a tariff based on installed horse power is both

practicable and more equitable than sliding scales, the latter being only justified, where by reason of the size of the undertaking such as for instance Johannesburg the introduction of such a tariff *de novo* becomes difficult.

As for business consumers, a two-part tariff based on floor area or installed horse power seems to me more difficult to apply and not having any first hand knowledge of the application of such tariffs I reserve judgement on this point.

There were several expressions of opinion that tariffs should be related to what the consumer can afford, or is prepared to pay, or to the amounts a Municipality may wish to raise in aid of rates to cover the cost of other services. While of course the price of electricity, like any other commodity is related to a certain extent to ordinary economic laws and is thus dependent somewhat on what the market can bear this principle should not be made an excuse for grossly overcharging certain consumers or subsidizing others for political or other reasons unconnected with the business of electricity supply.

It must be remembered that electricity supply in the nature of things is a monopoly, and as such is wide open to abuse. It is in my humble opinion the moral obligation of those in charge of electricity supply to prevent such abuse, and there is a justification for some disinterested authority to exercise a certain amount of surveillance in this matter. Particularly I want to emphasize that in my opinion a local authority should not use electricity tariffs as a rating instrument to raise funds for services, for which it is not willing either to make a direct charge or to pay out of rates, thus increasing the cost of such an essential necessity in modern life as electricity supply to people, who neither benefit by nor even know they are paying for such extraneous services.

I note that the Association has seen fit to follow my suggestion to form a subcommittee on tariffs. While I welcome this move, and feel that such a committee can contribute materially in guiding the development of electricity supply, in this country, I would venture to suggest that to begin with its main function should be to provide a platform for objective discussion on problems connected with tariffs

and to serve as a channel for dissemination of available knowledge of the economics of electricity supply and of the art of constructing tariffs. Study of basic data and research into methods will naturally follow. This committee shall have to approach its task with humility and above all things an open mind.

### THIRD DAY

THURSDAY, 23rd APRIL, 1953

PRESIDENT: Good morning, Gentlemen.

We will now proceed with the Agenda. This morning we start off with:—

#### REPORTS OF SUB-COMMITTEES AND REPRESENTATIVES

The first one is the:—

#### WORLD POWER CONFERENCE

As your representative on the World Power Conference, I have to report that there was no meeting of the South African National Committee of the World Power Conference during the past twelve months.

The International Executive Council met in Chicago on the 4th September, 1952, and during the meeting there was a discussion on the technical programme of the next sectional meeting to be held in Rio de Janeiro in July, 1954. It was agreed that the subject of "Energy and Power in Tropical and Sub-tropical Countries" would be the high-light in the programme; and certain suggestions were put forward to broaden the scope for the benefit of all interested parties. This matter was left in the hands of the Brazilian National Committee who are arranging the programme in its final form.

The next item is the Electrical Wiremen's Registration Board. I have much pleasure in calling upon Mr. Smit, the Chief Inspector of Factories, Machinery, and also Chairman of the Wiremen's Registration Board to give you a brief report on the activities of the Board.

#### ELECTRICAL WIREMEN'S REGISTRATION BOARD

Mr. R. N. F. SMIT (Chairman, Wiremen's Registration Board):

*Membership and Meetings of the Board*  
1. In January, 1952, the Minister appointed the following members to the Electrical Wiremen's Registration Board in

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"BALLISTICS"

terms of Section three of the Act for the three-year term of office ending on 31st December, 1954:—

Messrs. R. N. F. Smit, Chief Inspector of Factories.

J. C. Fraser, a municipal electrical engineer and member of the "South African Institute of Electrical Engineers";

H. R. Townsend to represent electrical contractors;

A. Elisio and T. D. Bowness to represent electrical wiremen;

P. Sommerville, selected for his administrative experience.

2. Mr. R. N. F. Smit was designated as Chairman of the Board for the year 1952.

3. The Board held eleven meetings and the Examinations Sub-Committee met on ten occasions.

#### *Applications for Registration*

4. The attached Table I gives particulars of applications for registration considered by the Board in 1952, together with comparative figures in respect of the previous twelve years. In connection with the 509 applications received in 1952, the Board in 27 cases granted registration on the ground that exceptional circumstances had been shown to exist which justified exemption from the prescribed examinations. 417 Applicants were accepted for examination; 43 applications were rejected on account of insufficient documentary evidence of training and experience in wiring work, while in 22 cases, the Board deferred its decision pending receipt of further data in support of the applications.

5. Reference is made in Table II to the number of registration certificates issued. Out of a total of 5,141 applicants, registered to date, exemption from the prescribed examinations was granted to 2,378. At the time of inception of the Act, the majority of the persons thus exempted were holders of wiremen's certificates or licences issued by suppliers, and thus, in terms of the provisions of Section 12(1)(e), entitled to registration.

#### *Examinations*

6. The examinations conducted by the Board in terms of Section ten of the Act, consist of two parts, viz.:

Part A, a written examination,

Part B, a practical examination.

Section I of Part A covers the Wiring Regulations and Section II the Theory of Wiring. Candidates credited with success in the subject of Electricians II in the National Technical Examinations are exempted from the written portion of the examination of the Board's examination, provided they obtain at least 50 per cent of the maximum marks obtainable.

7. In Table II, appears an analysis of the 2,763 candidates who were successful in the examinations. It will be noticed that—

91 candidates were required to take Sections I and II;

282 candidates were required to take Section I;

327 candidates were required to take Part B;

408 candidates were required to take Section I and Part B;

1,655 candidates were required to take the full examination.

8. Of a total of 2,436 candidates who wrote Section I, 1,683 (69%) succeeded in passing at their first attempt, comparable figures being in respect of Section II—1,219 (69·8%) out of a total of 1,746, and in respect of Part B—2,268 (94·9%) out of a total of 2,390.

9. Figures in connection with the written examinations held in 1952 and in connection with the practical examinations to date, are given in Table IV and Table V respectively. The number of successful candidates in the written examinations is relatively small, but in the practical examinations, there is a far higher percentage, namely 88·2%.

10. It is the Board's practice to remove from the Examination Lists the names of prospective candidates who have failed to respond to three successive notifications of examination. In this way, 1,040 names have been removed during the past few years and in December 1952, the current register comprised 506 applicants of whom—

257 are still required to complete the full examination;

117 are still required to complete Part B;

74 are still required to complete Section I and Part B;

56 are still required to complete Section II and Part B.

#### Returns in Terms of Section 17(2)

11. In terms of Section 17(2) of the Act, every holder of a certificate is required not later than 31st March in every year to notify the Board of his residential address and whether he is still practising the trade of wireman. Table VI reflects the position in connection with these returns. It will be noticed that only a small percentage (20%) had at the end of 1952 complied with the requirements of the Act in this respect.

#### Determination of Areas

12. By notice in terms of Section 18, the Minister determined the following areas during 1952, as areas in which the provisions of Section 19 (Supplier to Inspect Wiring) and Section 20 (Wiring Work on Premises must be Performed under the supervision of Registered Wiremen) applied:

- Magisterial districts of Eshowe and Potgietersrust and the municipal area of Heidelberg (Transvaal);
- Magisterial district of Grahamstown;
- Magisterial district of Cradock;
- Magisterial district of Rustenburg.

13. Notice was also given that the Minister proposed to determine the following areas

after the lapse of a given period (shown in brackets in each case):—

- Municipal area of Thaba 'Nchu (1 year);
- Magisterial district of Lichtenburg (2 years);
- Magisterial district of Pietersburg (18 months);
- Magisterial district of Stellenbosch (1 year);
- Magisterial districts of George and Knysna (1 year);
- Magisterial district of Port Shepstone (1 year);
- Magisterial districts of Zeerust, Mafeking and Nelspruit (1 year);
- Magisterial district of Paarl (1 year).

#### Prosecutions

14. Section 19(1) of the Act lays down that wiring work must be inspected by the Supplier. In six cases, legal proceedings were instituted for contravention of this requirement.

15. Proceedings were also taken against four persons who contravened the provisions of Section 20(a), in that within a determined area, they performed wiring work without being holders of certificates of registration.

16. Furthermore, a supplier notified the Board of two prosecutions instituted in respect of contraventions of the electricity by-laws.

Table I.  
APPLICATIONS FOR REGISTRATION

Year	Number of Applications Considered by the Board	Decisions taken by Board					
		Exempted from Examination	Accepted for Examination	Refused	Deferred: Pending Receipt of Further Data		
1940	2,668	} 2,377	127	92	} 248		
1941	172		282	91			
1942	120		148	108			
1943	281		182	54			
1944	299		159	55			
1945	444		179	57			
1946	721		418	93			
1947	625		603	78			
1948	730		634	62			
1949	569		503	39			
1950	460		338	122			
1951	372		349	37			
1952	509		27	417		43	
TOTALS	7,970		2,404	4,339		931	270

Table II.  
 REGISTRATION CERTIFICATES

Year	Registration Approved, the applicants having been exempted from Examination	Registration Approved after the applicants had been successful in the Examination	Totals
1940	} 2,351	} 2,507	725
1941			780
1942			193
1943			178
1944			208
1945			218
1946			350
1947			501
1948			418
1949			572
1950	} 27	} 256	433
1951			282
1952			283
TOTALS	2,378	2,763	5,141

(Note: 26 Applicants entitled to registration have not yet applied for their certificates.)

 Table III.  
 ANALYSIS OF 2,763 CANDIDATES SUCCESSFUL IN EXAMINATIONS

Required to Pass	Number	Section I—2,436 candidates						Section II—1,746 candidates						Part B—2,390 candidates			
		Successful after						Successful after						Successful after			
		1st	2nd	3rd	4th	5th	6th	1st	2nd	3rd	4th	5th	6th	1st	2nd	3rd	4th
		ATTEMPT						ATTEMPT						ATTEMPT			
Sections I, II and Part B	1,655	1,127	329	127	48	14	10	1,158	298	128	48	16	7	1,569	82	4	—
Section I and Part B ...	408	294	93	14	4	2	1							394	13	—	1
Part B ...	327													305	21		1
Section I ...	282	204	67	4	3	3	1										
Sections I and II ...	91	58	19	6	3	4	1	61	17	9	1	2	1				
TOTALS ...	2,763	1,683 69.0%	508	151	58	23	13	1,219 69.8%	315	137	49	18	8	2,368 94.9%	116	4	2

Table IV.  
WRITTEN EXAMINATIONS, 1952

Number of Notifications issued ... ..	1,121
Number of Candidates Entered ... ..	593 (52.9%)
Number of Candidates Absent ... ..	38 (6.4%)
Number of Candidates Present ... ..	555 (93.6%)

## SUMMARY OF RESULTS

Candidates Required to Write	Present	PASSED		
		Sections I and II	Section I	Section II
Sections I and II ...	313	76	67	20
Section I ... ..	143		90	
Section II ... ..	99			37
TOTALS ... ..	555	76 (24.3%)	157 (34.4%)	57 (13.8%)

Number of candidates successful in the Sections which qualified them for Practical Examination, or, if exempted therefrom, for registration ... .. 203 (36.6%)

Number of candidates who failed and were required to re-write:

Sections I and II ... ..	150
Section I only ... ..	73
Section II only ... ..	129
	<u>352</u> (63.4%)

Table V.  
PRACTICAL EXAMINATIONS

Year	Number of Examinations held	Number of Candidates Examined	Number of Successful Candidates
1942	2	50	49
1943	2	73	67
1944	3	130	123
1945	4	158	145
1946	7	249	229
1947	8	362	299
1948	7	249	227
1949	9	460	381
1950	9	393	347
1951	7	289	253
1952	8	265	242
TOTALS	66	2,678	2,362 88.2%

Table VI.  
RETURNS IN TERMS OF SECTION 17(2)

Registrations			Returns Received up to end of Year:—										Returns Received Up to End of 1952	
Year	Number	Cumulative Total	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	Cumulative Total	Percentage
1940	725	725	25	22	19	33	56	6	20	28	47	108	108	14.9
1941	780	1,505	28	51	13	37	39	2	16	20	36	69	177	11.7
1942	193	1,698	8	12	7	11	14	3	2	5	9	26	203	11.9
1943	178	1,876		44	10	13	16	1	7	7	11	17	220	11.6
1944	208	2,084			37	24	22	4	12	12	17	13	233	11.1
1945	218	2,302				62	25	3	9	11	21	21	254	11.0
1946	350	2,652					92	6	10	15	25	41	295	11.1
1947	501	3,153						14	34	33	39	104	399	12.6
1948	418	3,571								107	37	37	492	13.7
1949	572	4,143								176	68	130	622	15.0
1950	433	4,576									104	186	808	17.6
1951	282	4,858										164	972	20.0
TOTAL	4,858		61	129	86	180	264	39	217	344	414	972		

PRESIDENT: Mr. Smit: Thank you very much for your report. I would also like to pay a tribute to Mr. Smit. Mr. Smit is the Chairman of the Board and as such, of course, gets most of the knocks, and is in office all the time, whereas we, as his Committee, only meet once a month. We leave the difficult parts to the Chairman to square up while we go home. I think our vote of thanks is due to Mr. Smit for submitting his report and for the way in which he carries out his work as Chairman of the Board and I will ask you to show it in the usual way. Does anybody wish to discuss any matter arising from the report? If not, I will pass on the the next Item:—

#### REGISTRATION OF ELECTRICAL WIRING CONTRACTORS

Mr. C. G. DOWNIE (Cape Town): Mr. President: I actually have not prepared a report on this matter but can state that the position is that a proposed Regulation for the Registration of Electrical Wiring Contractors was drawn up last year and presented to the Convention in Bulawayo, specifying the requirements precedent to the registration of a Wiring Contractor. In terms of the Electrical Wiremen and Contractor's Act No. 20 of 1939, a contractor may not be issued with a Contractor's Licence unless he occupies premises that are described as being "suitable". It was decided some time ago to draw up a Code, one of the objects of which was to lay down, for instance, what

was considered to be "suitable" premises. The contractor must also be in possession of "adequate equipment" for carrying out and testing wiring work.

Just this morning, at the Executive Committee meeting, we reappointed the Sub-Committee, and we are again going into this matter of drawing up a Code specifying, for example, what we should regard as being "suitable premises" and "adequate equipment" so that we can all adopt something that will be uniform in connection with our obligations to register Wiring Contractors. This Committee will also go into, and consider revisions to the Electrical Wiremen and Contractors' Act.

Two bodies have already submitted proposals for amending this Act, and the Association of Municipal Undertakings also have been asked to officially consider amendments and submit them to the Government.

We have not come to any definite conclusions as regards the requirements precedent to the registration of Wiring Contractors. The matter is still in abeyance, and I hope that before the next Convention we shall have something definite to put forward to you.

PRESIDENT: In thanking Mr. Downie I would just like to emphasise his remarks in which he has indicated that the authorities within the Department have informed us that they intend amending the Wiremen and Contractors' Registration Act. I am sure

you have all got copies of that Act. If any member would like to send in any suggestions to amend the Act, they should be sent to our Secretary, so that he can pass them on to the Delegates representing the Association in connection with amendments to the Electrical Wiremen's Registration Act.

The next Item is the:—

### SOUTH AFRICAN BUREAU OF STANDARDS

Mr. J. L. van der WALT (Krugersdorp): The attached schedule shows the position at the end of March, 1953, regarding specifications and Codes of Practice, in which your Association has an interest.

From this schedule, compared with the schedule previously submitted, it will be seen that the year under review has been a very active one, in that twelve specifications were published, eight new specifications are in the course of publication, two new specifications have reached the reviewing stage following comment, and ten new specifications are being drafted. All Safety Specifications were revised or amended.

Your Association has again been represented on all drafting of specifications committees in which members of your Association may have an interest.

#### Quality Specifications

##### (a) Reinforced Concrete Poles

This new Committee was formed to draft a specification for Reinforced Concrete Poles for Telegraph, Telephone, Power and Lighting Purposes. Since concrete poles are being used more extensively today than ever before, this specification will be of great help to members of this Association. The draft specification has been completed and has been issued for comment.

##### (b) Low Voltage Porcelain Insulators

This draft specification was completed and is now finalised. A point of interest is that the unified thread is specified.

##### (c) Porcelain Bobbins, Cleats and Tubes

This draft specification has been finalised and should therefore be published in due course.

##### (d) Electric Fuses

The drafting committee decided to draft three separate specifications, namely:—

Rewireable Fuses;

Cartridge Type Fuse Links;

Cartridge type electric fuses for low and medium voltages;

as the consensus of opinion was that one specification could not cover the field properly.

#### Safety Specifications

As mentioned before, all Safety Specifications were revised in the light of it being promulgated as compulsory specifications. They have now been submitted to the Council with the recommendation that after approval these specifications should be submitted to the Minister of Economic Affairs for compulsory promulgation, according to the resolution taken by this Convention at Bulawayo. A similar resolution was passed by the Chamber of Commerce at their conference held during October, 1952.

#### Code of Practice

##### (a) Testing of Electricity Meters:

Approximately two years ago this code was published and adopted voluntarily by by some Local Authorities, so as to gain experience and thus recommend amendments.

From this experience gained it has been thought advisable to redraft the code. The Code is now in its final form and should be published in the near future. The following main amendments were made:—

1. The Administrative section has been deleted, as it is considered that this section should be published by the Controlling Authority in the form of regulations, probably under the Electricity Act, as and when promulgation of the Code takes place.
2. The period of certification has been increased from 6 to 10 years.
3. Maximum Demand Meters have been included.

#### General

As your Association is the largest consumer in the Country, as a group, these specifications are of vital importance to members of this Association. It is regretted, however, that so few comments are received from members after the codes and specifications have been issued for comment. A special appeal is made to members, to study these drafts and submit comments. These comments are not only of great help to the drafting committees, but also serve to keep members informed of developments in standardisation.



In conclusion, I would like to thank all those members who sacrificed so much of their valuable time in assisting with the drafting of these Codes and Specifications. Without their assistance, it would be impossible to arrange for representation of this Association on the various committees responsible for drafting these documents.

The Director and Staff of the Bureau also deserve a vote of thanks from this Association for their co-operation and assistance. I can assure the Convention that they have the interest of the consumer at heart.

## 1. SPECIFICATIONS AND CODES OF PRACTICE PUBLISHED

### Codes of Practice

- 01-1948 Electricity Meter Test Code (Revised 01-1953 being published).  
03-1947B Protection of Buildings from Lightning (Under Review).

### (a) Quality Specifications

- 2-1947B (Revised 2-1952 being published).  
Storage Batteries for use in motor vehicles.  
56-1949 Tungsten Filament General Service electric lamps.  
97-1950 Paper Insulated Electric Cables for General Purposes.  
\*97-1951 (EN) Paper Insulated Electric Cables for General Purposes. (Emergency Specification).  
98-1950 Paper Insulated Cables for Heavy Duty.  
\*98-1951 (EN) Paper Insulated Cables for Heavy Duty. (Emergency Specification).  
150-1950 P.V.C. Insulated Electrical Conductors.  
\*150-1951 (EN) P.V.C. Insulated Electrical Conductors. (Emergency Specification).  
151-1952 Fixed Electric Storage Water Heaters. (Revision).  
\*152-1951 Manually Operated Enclosed Type Airbreak Switches and Isolators.  
153-1950 Electric Stove and Hot plates.  
154-1950 Electric Cooking Plates.

- \*155-1951 Miniature Circuit Breakers for Lighting, Heating and Domestic Installations.  
\*156-1951 Miniature Circuit Breakers for the protection of electric motors.  
\*157-1950 Electric Toasters.  
\*158-1950 Portable Electric Appliances for Heating Liquids.  
\*159-1950 Domestic Electric Irons.  
\*160-1950 Electric Air Heaters and Radiators.  
\*162-1951 Screwed Steel Conduit and Fittings for Electrical Wiring.  
\*163-1951 Wall and Appliance Switches.

### (b) Safety Specifications

All Safety Specifications were revised or amended, i.e.

- SV 101-1948 Manually operated air-break switches.  
SV 102-1948 Portable electric immersion heaters.  
SV 103-1949 Electric radiators.  
SV 105-1948 Fixed electric water heaters.  
SV 108-1950 Domestic electric washing machines.  
SV 109-1950 Plugs, socket outlets and socket outlet adaptors.  
SV 111-1949 Replacement type heating units.  
SV 112-1950 Electric hand lamps.  
SV 113-1950 Electric toasters.  
SV 114-1950 Electric irons.  
SV 115-1950 Electric soldering irons.  
SV 117-1950 Electric stoves and hotplates.  
SV 118-1950 Small extra low voltage transformers.  
SV 119-1950 Lampholders and bayonet lampholder adaptors.  
SV 121-1950 Apparatus connectors for portable domestic appliances.  
SV 123-1950 Portable electric reading lamps.

## 2. SPECIFICATIONS IN COURSE OF PUBLICATION

### (a) Quality Specifications

- 314-1951 Flameproof enclosures of electrical apparatus.  
\*168-1952 Medium Voltage Vulcanized Rubber Insulated Cables and Flexible Cords for Power and Lighting Purposes.

- \*169-1953 Vulcanized rubber insulated cables for tele-communication and signalling purposes.
- \*164-1953 Two-pole and earthing pin plugs and socket outlets.
- 339-1951 Creosoted Wooden Poles for telephone, telegraph, power and lighting purposes.
- \* Low voltage Porcelain Insulators.
- \* Porcelain Cleats, Bobbins and Tubes.

**(b) Safety Specifications**

- \* Flexible Cords for Power and Lighting Purposes.
- SV 100-1948 General requirements for portable domestic and industrial electrical appliances. (SV 100-1953 revised).
- SV 107-1950 Portable appliances for heating liquids (under revision).

**(c) Codes of Practice**

- \*046-1952 Code of Practice for the Prevention of deterioration due to tropical conditions.
- \* Safety Code for handling anaesthetics in hospitals.

**3. SPECIFICATIONS UNDER REVIEW FOLLOWING COMMENTS****(a) Quality Specifications**

- \*Apparatus Connectors for Portable Domestic Appliances.
- \*Flexible polyvinyl chloride (P.V.C.) compounds for electrical purposes.

**(b) Safety Specifications**

- \*Domestic Radio and Electronic Apparatus

**4. SPECIFICATIONS IN COURSE OF PREPARATION****(a) Quality Specifications**

- \*Cartridge Type Fuse Links for Low and Medium Voltage electric fuses.
- \*Cartridge Type Electric Fuses for Low and Medium Voltages excluding fuse-links.
- \*Rewireable type Electric Fuses for low and medium voltages.
- \*Insulating tapes.
- \*Lampholders.
- Small Domestic Type Lightning Arrestors.
- \*Intrinsically Safe Electrical Apparatus.
- \*Reinforced Concrete Poles for Telegraph, Telephone, Power and Lighting purposes,

**(b) Safety Specifications**

- \*Electric heating pads and blankets.
- (c) Nomenclature in electrical engineering and standardization of electric and magnetic magnitudes and units.
- \*Additions and alterations to list previously reported at last convention.

PRESIDENT: Does anyone wish to discuss this report? If not, I will ask Mr. van der Walt to continue and give you his report on the:—

**METER TESTING CODE**

Mr. J. L. van der Walt (Krugersdorp): The Meter Testing Code was first mentioned at the Bloemfontein Convention in 1946 where it was indicated that a newly established body, the South African Bureau of Standards, was dealing with the matter and a sub-committee was formed. All this was due to Pietermaritzburg asking for information re meter testing equipment.

In 1947 at Durban, Mr. J. C. Downey reported that the first draft of the Code was circularised to all members for comment.

In 1948 at East London, Mr. Downey reported that the Code was now completed. Mr. Clarke of the S.A.B.S. read a paper on what the Bureau intended to do. Testing stations of three classes, A., B. and C. These stations to obtain an approval certificate from the Bureau. The Bureau was to appoint officers to visit testing stations only and test 5% of meters tested. Visits were to be mutually arranged. The estimated cost of overhauling, calibrating and certifying meters were given as follows:—

A.C. Single phase meters 16/—.

A.C. Poly-phase meters 30/—.

D.C. Meters 32/—.

These figures included a Bureau charge of 1/6 per meter tested. A motion opposing the meter test code was lost. (24 for and 37 against) and it was decided that the Code should be introduced without further delay.

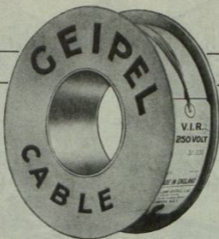
In 1949 at Port Elizabeth, the Electricity Control Board expressed the wish that the Convention again take a decision, in view of opinions the Board obtained from smaller Municipalities. The Executive saw no reason to put before convention a review of the matter, but smaller Municipalities were asked to express their views freely.

\*Additions and alterations to list previously reported at last convention.

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The representative from the Control Board then indicated that he was satisfied re the necessity of the code.

In 1950 at Pietermaritzburg, the Electricity Control Board representative indicated that notwithstanding the previous resolution by this Convention and views expressed at the Port Elizabeth Convention the Board was not satisfied that all Municipalities wished the Code to be promulgated. A number of members expressed their disappointment at this attitude, stating that it appeared that resolutions taken by convention, were not treated with respect. The convention reaffirmed its previous resolution.

In 1951, at Cape Town, the representative of the Electricity Control Board again asked for a vote on the matter. The Executive then put forward the motion that the Code be adopted voluntarily for one year, so as to gain experience. This was agreed upon.

In 1952 at Bulawayo, the Electricity Control Board representative for the fourth time again asked for a decision from the Convention. It was resolved, however, that—

“Although this Association is convinced of the desirability of a compulsory meter testing code, it cannot agree to the promulgation of a code until such time as the Association's constituent local authorities have had an opportunity of considering the Code in its final form and its possible financial implications. The resolution was taken as it appeared that the fees to be charged deviated considerably from the original indicated.

I have mentioned in my report on the South African Bureau of Standards, that the Code has now been finalised and is ready for publication. The Administrative section has been deleted and will most likely be promulgated as regulations under the Electricity Act.

It is this Administrative section, that is of great concern to our Association. Under this section, the levy to be charged will be promulgated.

A sub-committee of the Executive consisting of Messrs. J. C. Fraser, J. C. Downey and myself were appointed and two meetings were held with representatives of the Electricity Control Board, the Authority to control the code, and the South African Bureau of Standards.

The levy to be charged to undertakings was the main point under consideration at these meetings. Various proposals were considered and rejected.

The most favourable proposal appears to be an annual licence fee for authorised testing stations as follows:—

Class A Station—£30.

Class B Station—£22 10s.

Class C Station—£15.

This fee would only ensure that the testing station was properly equipped to carry out the requirements of the Code.

On the South African Bureau of Standards' estimated cost of administering the code, i.e. seeing whether the code was being followed by all local authorities and owners of meters who distribute electricity there would be a substantial shortfall. To meet this shortfall, it has been suggested to the Electricity Control Board that the Board as the Controlling Authority of the code should approach the Government re a subsidy. The opinion was expressed that the code should be administered as originally intended. A communication from the Board regarding this matter is awaited.

A communication from the Electricity Control Board has now been received, stating that the Board will accept the above licence fees suggested. The Board will recommend to the responsible Minister that any general administration expenses incurred, should be met from Government Funds.

Upon acceptance of the above by the A.M.E.U., the Board will take steps to promulgate the necessary regulations. The Board proposes that the regulations will become effective two years from date of publication, in order to enable the undertakings to prepare themselves for the enforcement of the Code.

It is therefore recommended that this Convention indicates its willingness to accept the Meter Test Code as a compulsory code, subject to the condition that there be no additional charge to local authorities, except the annual licence fee of £30, £22 10s. and £15 for Class A, B and C stations respectively.

PRESIDENT: Is there any discussion on the Meter Testing Code? We have the representative on the Bureau of Standards here, if there is any question any member

would care to ask him. If not, may I put the resolution which Mr. van der Walt has recommended? That is:—

"We approve of the meter testing code, on condition that the only charge to local authorities will be an annual licence fee of £30, £22 10s. and £15 for Classes A, B and C stations respectively. This fee would only ensure that a testing station was properly equipped to carry out all the requirements of the Code."

I think that was the recommendation. I would like this matter to be dealt with seriously in the minds of Delegates, because I wish to take a vote.

Mr. A. FODEN (East London): Do I also understand from Mr. van der Walt that there will be no additional charges.

Mr. J. L. VAN DER WALT: It was a recommendation when the question was raised that this Convention accepts that annual fee on the condition that it will be the only charge.

Mr. A. FODEN: That raised a lot of controversy last year; I also took exception to it. Now that the subject of an annual fee has been settled, there may be no charge other than the licensing fee.

Mr. J. L. VAN DER WALT: That is correct, Mr. President, but the final decision still lies with the Electricity Control Board. This however will be our recommendation to the Electricity Control Board, as the probable authority controlling the Code, that we are prepared to accept the Meter Test Code with this proviso: that only the annual licence fee mentioned be charged; no other charge.

There is one point, however. Owners of meters and small local authorities who have not got testing stations will have to get their meters tested at recognised and authorised testing stations, and naturally, of course, would have to pay the expenses towards that.

Mr. A. FODEN: Would it not be desirable then to try and formulate a standard charge for various types of meters? Because I can foresee trouble again. Some other local authority may make a different charge for the same work due to varying overhead charges. I think the subject of standardising testing fees might be considered.

Mr. J. L. VAN DER WALT: I do not think the figures that Mr. Clark gave at East London in 1948 will still be correct to-day. Mr. Clark gave, for a single-phase meter, the cost of overhauling, repairing and testing as 16/—, but that charge included one of 1/6d. per meter to the Bureau; so you naturally subtract that. It also included transport charges, which we cannot lay down. That could be used as a basis for discussion, but it has not been considered, as yet; and I do not say that the figure holds good to-day.

The main point to-day is, whether this Convention agrees and recommends that the Code be promulgated, subject to those conditions.

There will be a time limit of two years. Within those two years, I think, if this Convention agrees to it, this Association could form some standard charge, if it so wishes: but I personally think that it will vary from district to district, depending on the distance from the testing station, etc.

Mr. W. H. MILTON (E.S.C.): Mr. President, in connection with the question of the fees for testing, I was rather disturbed by the suggestion that they should be fixed by agreement between the owner of the testing station and the local authority which has no testing station.

In my own experience, agreements of this description dealing with a matter of compulsion can lead to a lot of trouble; and I do think it should be essential that a central body, such as this Association, if you like, should decide ultimately what those fees should be and what is a fair charge between the owner of the station and the users of the meters.

Mr. G. J. MULLER (Bloemfontein): Mr. President, on the subject of charges, I should think that the same rule that holds in Commerce—that is, top price level, would be fixed; that, I imagine, would be the correct procedure; in other words, maximum prices laid down.

You can imagine that this price may be unnecessarily high in some cases where the testing authority is quite near to the local Undertaking which has no station; and one would not like to lay down a compulsory price but merely a maximum price which can be charged, and which could be laid down by the Board.



Mr. P. BECHLER (Harrismith): I do not understand why the testing station at Harrismith should have to pay a licence fee of £30, or something like that; I think £5 is sufficient; and, furthermore, those Undertakings which have got no testing station have to send their meters to a testing station; and the other stations which we now have are obsolete. Is that so? Because only recognised stations might test a meter. Is that right or wrong?

Mr. J. L. VAN DER WALT: Mr. President, that is in a way correct. Only stations authorised, and having obtained that licence will be entitled to test meters; but any local authority is entitled to establish its own testing station and can then apply for the licence. The Bureau of Standards will then send someone to verify whether that station is equipped to carry out testing according to the class of station applied for, either A., B. or C. If its equipment is found to be in order and adequate, it will be issued with a licence and will be then authorised to test meters.

Mr. C. LOMBARD (Germiston): Mr. President, I think it would be of interest to some local authorities to know whether the Code would apply and cover sub-meters installed by owners of premises in large buildings such as blocks of flats, and so on. We now have to provide facilities to test those meters.

Mr. J. L. VAN DER WALT: The Code will apply to all owners of meters; that will include owners of sub-meters. They will have to send their meters to some recognised testing station and get them tested. Every owner of a meter who sells or distributes electricity will be required to comply with the Code.

Mr. A. FODEN: As the Convention will gather, I am rather keen on this question of fees. I would like to know if there will be any additional charges when Officials of the Bureau visit the testing stations to ascertain if they comply with the necessary requirements. It is conceivable that these additional charges may be quite apart from the licence fee.

Mr. J. L. VAN DER WALT: Your licence fee covers that; that is what you pay the licence fee for; it is for the services

of the Bureau of Standards; that is, verifying whether your station is equipped to carry out the Code.

Mr. D. A. BRADLEY (Port Elizabeth): Mr. President, do I understand that if the Bureau of Standards decides that a second visit is necessary, there will be no further charge for the licensee to meet for this service?

Mr. J. W. SWARDT (S.A. Bureau of Standards): The matter was carefully investigated and there is no doubt that the fees now proposed viz. £30, £22 10s. and £15 are extremely nominal. If one considers the long distances involved in making inspections at stations as far distant as Cape Town then the fees are highly inadequate, since one day's visit to Cape Town would cost at least £50.

With regard to the query that has been raised as to what happens if the Bureau has to re-visit a station, I would envisage only one charge. No provision has actually been made for repeat visits and it would seem desirable to provide for such emergencies. The Electricity Control Board may have to consider such measures in the near future.

It should be made clear that these charges are levied by the Electricity Control Board and not by the Bureau of Standards since it is this body that deals with the promulgation of the Meter Code. The Electricity Control Board may however, pass over the fee or part thereof, to the Bureau depending on what they wish to retain for their own administrative costs.

Mr. K. W. J. HALLIDAY (Port Shepstone): It has been reported quite correctly, I think, about the meter testing station licence fees; but I do think that for municipalities who have not got a testing station it would be very helpful if the Board could lay down some figure with regard to the testing fees; I mean the individual testing fees when we send out meters to the meter testing station, as a guide to our Councillors as to what expenditure might be involved. It is quite correct about transport, but I think that item could be quite easily left to the station requiring the meters to be tested; they could be sent "Carriage Paid" to the station, and sent "Carriage forward" from Testing Station after having been tested. I think it really could be given by the

Committee; they could give us rough figures to hand over to our Council, at so much for a straight test, because one normally gets people who query their account; when one does not always want the meter overhauled and repaired; one only requires a test figure. So, if you could give us some rough idea of a test figure, an overhaul figure, and a total inclusive cost, it would assist.

Mr. C. R. HALE (Pietermaritzburg): I would like to throw out a suggestion. I am mixed up with transport. Now, to get any figure for testing a meter, just as for overhauling an engine, you cannot give it as a fixed cost because of the variation in the cost of labour. Lots of us have variable cost of living allowances, and so on. Well, in the "Motor World" they have issued a "Flat Rate Journal"; it is a very fine edition, which you can buy for three guineas, and it gives you the number of hours for decoking an engine, line boring, resleeving, and so on.

Now, we could, I think, get the Executive or any small Sub-Committee to put in a "Flat Rate Journal" idea of the number of hours necessary to do this meter testing. From that, of course, you estimate the cost of testing the meter. Just as a guide to other centres, I might mention that we have been doing this sort of thing for Howick and different centres, and it has worked out at about 12/6d. So it would not be a very hard thing to work out the flat rate in hours, but not to state definitely so many shillings and pence, because all our costs of labour are likely to move, and are different.

Mr. E. L. SMITH (Boksburg): Mr. President, I feel that it will be difficult at this stage to lay down a fixed charge. A meter may be received that has its potential and current coils burnt out, or even a damaged train; the result is that the cost of these repairs, the overhauling of the meter and the testing of it make the cost £2 or £3, so we have difficulty in laying down a fixed charge.

It is possible to lay down a fixed charge only for the cleaning and testing of a meter.

Therefore, I do not favour a fixed charge for the repairing and testing of meters.

PRESIDENT: It is quite obvious that there will be a lot of discussion on the question of charging for meter testing and

repairs, and I would like you to divorce that subject entirely from the one we are discussing this morning. What we are discussing is whether we approve of establishing A., B. and C. stations and the fees that are going to be charged by the Bureau of Standards for passing and seeing that these stations are thoroughly equipped to test meters. The question of charges for meters which are sent to these stations to be tested will have to be a matter of considerable discussion and, as pointed out by the various speakers, will probably vary according to the district; but eventually we will get down to a charge for testing only and probably a charge for any further repairs.

Mr. G. J. MULLER (Bleomfontein): Mr. President, it is clear to me that the question of costs for testing is worrying members. You will notice that there are A., B. and C. Stations. A C. station is a fairly modest affair, which even a quite small undertaking can set up and apply for, and you would balance the cost of a C. station against the cost of testing meters. If the number of meters to be tested is so small that it does not balance even the modest cost of a C. station, then, of course, you would send them to an authority; but each individual supply Undertaking, if they can face the cost of a C. station, would not necessarily send their meters out to be tested. So that, if you are overcharged, you always have the remedy in your own hands.

PRESIDENT: Gentlemen, are you ready to take a vote on the most favourable proposal that your Sub-Committee, after sitting on very many occasions, now passes on, and that is that the Electricity Control Board have come along and suggested that:

"The annual licence fee for Class A. Stations be £30; for Class B. Stations £22 10s. and for Class C. Stations, £15."

I will now ask if anybody, or any town, is not in favour of supporting this resolution. (There being no opposition). Then, can I take it, it is unanimous?—Agreed.

The next item is the—

#### SAFETY PRECAUTIONS COMMITTEE

Mr. J. C. DOWNEY (Springs): Mr. President and gentlemen, there is very little I can tell you in regard to the promulgation of the Wiring Regulations. Your Committee has been working on this

during the year, and they have run into quite a few difficulties, which are now being rapidly overcome, and it is hoped that in the near future circulars will be issued by your various group conveners advising you of the procedure and methods that must be adopted in order to accept the second edition of the Wiring Regulations as standard Regulations for the wiring of premises. That is all the information I am in a position to give at the moment.

**PRESIDENT:** Is there any discussion arising out of this matter?

**Mr. A. FODEN (East London):** I would like to ask Mr. Downey if the second edition now has the force of law? As I think, at the last Convention, it was held up, because it had not been translated into Afrikaans.

**Mr. J. C. DOWNEY:** The translation has been accepted in the Transvaal. So far as I know the draft copy of the Afrikaans translation has been approved of and checked in the other Provinces and will in all probability be in the hands of the printers. I would like to make it clear that the second edition cannot become law until it has been adopted by the towns concerned.

As you know, the second edition has to be accepted before it can be promulgated and the first edition must be withdrawn when the Blue Book becomes law in the undertaking concerned.

**PRESIDENT:** Is there any further discussion, gentlemen? If not, I will pass on to the next item:-

#### OVEHEAD LINES—CODE OF PRACTICE

**PRESIDENT:** The Council of the South African Institute of Electrical Engineers have decided that the Code of Practice for Overhead Lines should be checked for possible revision approximately every three years. Accordingly the Drafting Subcommittee met on the 26th September, 1952, and, after discussion, decided that any revision of the Code should be based on experience of its application in actual practice.

With a view to obtaining the required information, it was agreed that a communication be addressed to the organizations represented on the original Code of

Practice Main Committee, asking for criticisms of the Code.

Members of the A.M.E.U. were acquainted of this through the medium of Bulletin No. 15, and were requested to forward their comments to me for presentation to the Drafting Sub-committee. As yet comments have been received from only one municipal undertaking and these have been passed on to the South African Institute of Electrical Engineers.

The next meeting of the Code of Practice Drafting Subcommittee will be held after a suitable period for receipt of comments has lapsed.

Time is getting on, gentlemen; if anybody has any amendments to make to this Code of Practice, will they please forward them to me as soon as possible. Is there any discussion on this report? If not, I will pass on to the next item:-

#### COAL SUPPLIES

**Mr. C. G. DOWNIE (Cape Town):** During the winter of 1951, which was one of the coldest and most severe since 1945, consumers of coal—power stations in particular—suffered shortages which can be described as being the worst ever experienced. So serious was the position that the coal stocks of the power stations at one of the Union's big cities became so low as to cause the decision to be made to shut the power stations down over the week-end at the end of June 1951. This desperate situation was saved only just in time by ministerial intervention which resulted in supplies of coal forthcoming from other than normal sources just in time. Other power stations throughout the Union suffered similar trials in varying degrees.

Following upon the coal crisis of 1951 a Coal Shortages Commission was appointed to make recommendations towards preventing a repetition of the events of that year. Representatives of your Association gave evidence before that Commission.

Arising from the Commission's recommendations the suggestion was made in Parliament that a special Committee be formed primarily to go into the requirements of power stations and the South African Railways and Harbours Administration and to determine priorities for the allocation of supplies of coal to those consumers. This Committee, now termed

the "Coal Allocation Committee," was appointed in March, 1952, and had its first meeting in Johannesburg on the 10th April, 1952, under the Chairmanship of Dr. H. J. de Villiers Industrial Adviser to the Department of Commerce and Industries and also Chairman of the Electricity Control Board. Membership of the Committee comprises representatives of the South African Railways and Harbours Administration, the Coal Owners' Association, independent coal producers, the Electricity Supply Commission and Municipal Electricity Undertakings.

Since it first met a year ago, the Coal Allocation Committee has had 22 meetings, at all of which the municipal undertakings have been represented. It can be claimed that the Committee has carried out its functions most satisfactorily to date through the fact that it has brought together in a spirit of helpfulness and co-operation all those who are vitally concerned with coal supplies all along the line from the producers, via the South African Railways and Harbours Administration, to the main consumers.

Serious attention has been given, not only to arranging for power stations to be adequately supplied, but also to the quality of coal particularly in so far as power stations at a distance from the coal mines are concerned. This is an important factor both from the aspect of the consumption of coal and its transportation because it follows that the better the quality (calorific value and grading) of the coal, the more efficiently will it be burned, particularly where the boilers are old. This results in less coal being consumed for a given output and therefore requires fewer trucks for its transportation from the coal mines.

From the aspect of adequate supplies suitable for power stations being made available by producers, the crushing of coal is now having to be resorted to, whereas in previous years the demand for small coals could be met from the natural risings of the mining of rounds and run-of-mine coal when this could be transported and exported in considerable quantity. Whereas at first the grades of coal produced by crushing contained a big percentage of fines—thus making it extremely difficult to be burned on the grates of boilers that were not designed

for such coal — the grading has since greatly improved. Those producers of coal who have installed crushers in order to meet the demands of consumers of small coals are deserving of appreciation for having installed such plant. Their further co-operation is being shown by their willingness to produce "smalls" of a grading suitable for boilers which were originally designed for coals of a high calorific value containing a small percentage of "duff."

I have referred to what the Coal Producers are doing. But I must also put in a special word of appreciation for the efforts which the South African Railways and Harbours Administration are making in organizing the transport of the coal from the mines to the power stations under very difficult circumstances that prevail today.

As one who knows what it means to have to impose power cuts due to the demands of consumers exceeding the capacity of power stations to supply I can sympathise with the Railways when they are finding it difficult to meet the transport needs of the country which have grown phenomenally during recent years. The System Managers are also to be thanked for what they are doing to speed up deliveries and keeping us informed of supplies of coal in transit.

Some electricity undertakings may be inclined to assume that with the setting up of a Coal Allocation Committee their troubles in regard to maintaining adequate reserves are over. Although the Committee knows what the position is at most power stations, this does not relieve individual undertakings from making representations to their suppliers of coal should despatches and deliveries of coal fall off and reserves become critically diminished. It is up to undertakings finding themselves in this position to make strong and urgent appeals to their suppliers in good time and not to delay their representations until reserve stocks have fallen to no more than enough to last one or two days. Should supplies of coal from normal sources be cut down for reasons beyond the control of their normal suppliers, it is up to the power station coal consumers to approach suppliers from other sources and this should not be left until it is too late. Lack of

foresight may make their case very difficult when it comes to the Coal Allocation Committee.

It was for this reason that one of your representatives on the Coal Allocation Committee addressed a circular early in March to the Electrical Engineers of Municipal Undertakings owning power stations drawing their attention to the need for building up stocks and that should they have any difficulty in doing so to notify the Secretary of the Coal Allocation Committee.

In order that your representatives on this Committee may be kept in touch with the position, municipal undertakings in May last year were circularised asking for data relating to their coal supplies. They were asked to submit figures regularly showing how supplies were coming in, how long they took to travel from the source to the power stations, what their weekly coal consumption and stocks were. The response to this circular was somewhat disappointing to start with, and it is far more so now as information is now being received regularly from only six undertakings. Presumably this may be taken as an indication that most municipal power stations are not having any difficulty in being supplied with the coal they need and that they have adequate stocks in reserve. However, as mentioned previously, should supplies fall off and reserves become diminished at any power station, those responsible should not delay until they are in serious difficulty before taking steps to improve supplies and stocks.

PRESIDENT: I would like to say, gentlemen, that a hearty vote of thanks is due to Mr. Downie, and Mr. Hugo, who are our representatives on the Coal Allocation Committee.

I know that Mr. Downie has left Cape Town on many occasions when he could ill afford to leave his post, but, in the interests of all power stations who use coal, he came up here very often. So I would ask you to accord Mr. Downie and Mr. Hugo a very hearty vote of thanks. (Applause.) Would anybody like to discuss this burning question?

Mr. D. A. BRADLEY (Port Elizabeth): Mr. President, I would like to say just a word of commendation, if I may, to the

Chairman of the Coal Allocation Committee, Dr. De Villiers, who has so ably controlled this Committee and made such adequate and suitable arrangements that we—at least, I speak for myself,—in our far corner of this wonderful country of ours, opposite to Mr. Downie's, in recent days, have had every cause for rejoicing in the knowledge that at least our coal troubles are now alleviated. I want it recorded, Sir, that Dr. De Villiers and his Committee be given our special thanks and commendation.

Mr. W. H. MILTON (E.S.C.): Mr. President, I wish to add my congratulations on the very good work that has been done by both Mr. Downie and Mr. Hugo. Coming from a member of the Committee who is not responsible to this Association, I feel I am able to bring home to members the very great debt they owe to these two gentlemen for what they have done for them; and, in particular, I think Mr. Bradley of Port Elizabeth must be very grateful, as they have been able to look after his interests in spite of the absence of information from Port Elizabeth.

As the next meeting of the Coal Allocation Committee is on Tuesday, I think it would be very apt if your representatives were given instructions from the floor at this Convention on any points which they feel should be taken up and stressed.

PRESIDENT: I do not know whether this is a chance for Mr. Bradley, or not.—(Laughter.) The next item is:—

#### AMENDMENTS TO THE CONSTITUTION

Mr. G. J. MULLER (Bloemfontein): Mr. President, I do not know whether I should say that I am pleased or sorry, but, in response to a request, from the Secretary, for comments, I have to state that the Sub-Committee dealing with this matter has dealt with it by correspondence; and we have, from the comments among ourselves and a few other matters outside the Sub-Committee, redrafted the Constitution. I have prepared a complete redraft and have brought along with me the Roneo wax sheets, so that any minor adjustments which the Executive can effect during this session can be made. It is proposed, after this Convention, to circulate to all members a copy of the

draft. The draft is not in comparative form; it is simply a redraft of the Constitution. You all have a copy of the old Constitution, and I would like you to compare it clause by clause, and let me have, in Bloemfontein, any comments or suggestions that you may want to make on the draft, so that we can finalize it before the next Convention, at Bloemfontein.

**PRESIDENT:** Thank you, Mr. Muller. I would like to draw the attention of members to the fact that the Constitution is published in the *Journal*; and you will have to compare the new Constitution with the old one which appears in the *Journal*.

Is there any discussion on that matter? If not, that concludes the Reports from the Sub-Committees and the Representatives.

#### SOUTH AFRICAN COMMITTEE OF ILLUMINATION

**PRESIDENT:** I would like to announce that my attention has been drawn to the fact that a South African National Committee of Illumination has been formed, and that our worthy friend, Mr. J. C. Downey, from Springs, has been appointed President of it. Your Association has not yet taken any active part in that body, but any information that you require will be gladly given by Mr. Downey.

**PRESIDENT:** I have much pleasure in calling upon Mr. J. E. Mitchell, the Electrical Engineer of Salisbury, to deliver his paper entitled "Centralized Injection Ripple Control of Water Heaters and Street Lighting in Salisbury."

#### CENTRALISED INJECTION RIPPLE CONTROL OF WATER HEATERS AND STREET LIGHTING IN SALISBURY, SOUTHERN RHODESIA

BY

J. E. MITCHELL.

B.Sc. (Tech) Hons., M.I.E.E., M.I.Mech.E.

#### Summary

The object of this paper is to present a history of the installation of ripple control in the City of Salisbury, Southern Rhodesia.

After describing the reasons which led to the decision to install this type of control, the method of installation and its cost is detailed.

An account of the effect on the demand on the power station and on cables and substations, and the method of street lighting control, is given.

The economics of the use of ripple control, as applicable to Salisbury, follows.

Finally, the reaction of consumers after installation and use is described. Throughout the paper stress is laid on the fact that results in Salisbury will not necessarily apply exactly in other centres in the Union and in the Rhodesias.

#### (1) Introduction

Salisbury is a city in which the members of the public all wish to do the same things at the same time. Offices and shops commence work, and the Government offices open, at times very little later than factories start up. Everyone stops for lunch between 1 p.m. and 2 p.m., and bathing and feeding in the evening has little diversity in time between the various classes.

Consequently, there is very little staggering of the load on the power station, and the demand is very "peaky."

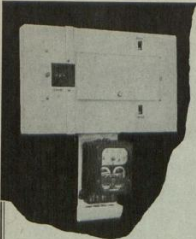
Fig. 1 shows the typical daily winter load curves of 1947 to 1952.

Fig. 2 shows the estimated winter and summer demands on the power station in 1957 with and without ripple control.

As Salisbury is the financial centre and the seat of Government, it is not expected that the shape of the daily load curve will alter substantially, although increased industrialisation is raising the growth of the morning load to some extent. Shift work, so that factories can work round the clock, seems to be so unpopular that it is impossible of being achieved despite the offers of low-priced power for such working.

With the very large increase in cost of both power station plant and distribution equipment, the department was set the problem of how to reduce the peak and increase the load factor without changing the habits of the public or the nature of the citizens' main occupations.

One obvious method was to store electricity, but as no one has as yet found how to do so, nor is likely to, the problem is changed to that of storing either



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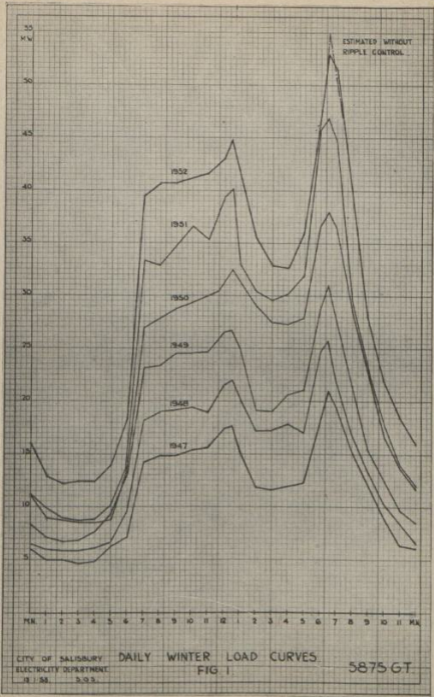
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DAILY WINTER LOAD CURVES  
FIG 1

5875 GT

DAILY LOAD CURVES  
SUMMER & WINTER 1957  
FIG. 2

5876 GT

M N I 3 4 5 6 7 8 9 10 11 R I 2 3 4 5 6 7 8 9 10 11 M



ESTIMATED EFFECT  
OF RIPPLE CONTROL

SUMMER

WINTER

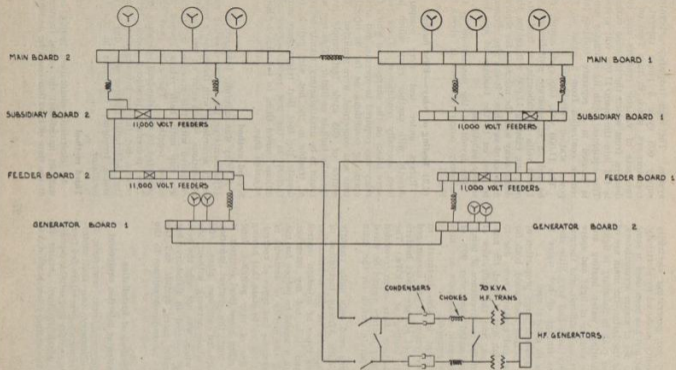


FIG. 3.- LAYOUT OF CENTRAL INJECTION EQUIPMENT  
IN RELATION TO POWER STATION BUSBARS.

5873 FT.

what is used for generating electricity or the commodity produced by electricity. The former method has been used in some degree by the use of steam accumulators. In the case of the latter, the main use of electricity over peak in Salisbury is lighting, space heating, water heating and cooking. The storage of light and space heating is obviously difficult, and thermal storage cookers have had very little success, but the storage of hot water is simple, and is in general use.

Whereas pre-war a large proportion of the Salisbury citizens used wood, both for water heating and cooking, now, due to shortage and high cost of wood, the non-existence of gas, and the difficulties of obtaining, and the inconvenience of using, coal, it is estimated that over 90% of Salisbury's domestic consumers are now all-electrically equipped.

The department is also fortunate in that for many years, it has encouraged the larger type of storage water heaters with a usual loading of 2 kW. The wiring regulations have also provided that these water heaters should be wired back to a separate switch on the main board.

A paper was read only quite recently before the South African Institution of Electrical Engineers on the technicalities of the various types of injection control equipment, and it is not my intention, nor do I think it would be proper for me, to enlarge on the merits or demerits of the various systems and types of control. It is sufficient for me to state that having studied the use of time switches, load limiters and other more local controls, it was decided that the central injection equipment situated at one place, and covering the whole network without the use of pilot wires, was not only the best for the duty required in Salisbury, but was considerably more flexible and the least likely to cause inconvenience to the consumers.

## (2) Method of Installation

### (2.1) Installation of injection equipment

The injection equipment comprises, in the case of Salisbury, two D.C. motor-driven high frequency generators fed from a mercury arc rectifier and suitable 6-phase transformer, which in turn obtains its supply from the ordinary low tension A.C.

system. The high frequency generators supply 605 cycle 3 phase current to transformers, which in turn feed on to two sets of variable reactors and condensers, from which the injection current is fed into the main 11,000 volt system. This equipment, with its contactor panel, is housed in a separate building and remote controlled from a panel on the power station switchboard.

The 11,000 volt, 605 cycle supply can be fed on to separate switches on the 11,000 volts switchboards, or feed on to outgoing existing 11,000 volt cables, thus doing away with the necessity for separate mainboard switches. It can also obviously be feed on to the busbars of any bulk supply substation.

The layout of the connections in the Salisbury power stations is shown in Fig. 3.

### (2.2) Testing of relays—First method

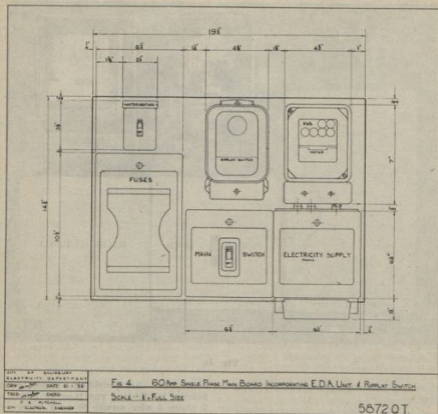
Relays under test were compared directly with another relay which had been specially conditioned. Three tests were taken on the channels on which the relay was required to operate, and actual operating conditions, as far as injection time was concerned, were simulated. The source of 605 cycle test supply is a specially built-in oscillator. This test was found to be unsatisfactory, mainly because of trouble in the hot wire switch, for, despite the fact that relays were satisfactory in the test room, service conditions caused them to fail, due to badly adjusted gaps.

### Second method

A relay was carefully prepared and all adjustments on the hot wire switch were set in accordance with the maker's recommendations. Each relay on test was then compared with this standard by altering the gap until both relays opened and closed together. The relay was then subjected to the standard operating test. This procedure produced much better results, but further investigation showed that additional failures were due to unstable frequency conditions in the test oscillator.

### Third method

An electrically-maintained tuning fork was set up so that the actual frequency at the time of injection could be measured



and, in addition, the operating time for the hot wire switch was taken with a time interval meter, thus allowing for a much more accurate setting of the hot wire switch gaps. Testing relays by this method has eliminated practically all failures on the system.

### (2.3) Installation of relays in consumers' premises

The department decided on the installation of this equipment as far back as 1946, and the actual act of installation has been very simple, due to the following reasons:-

1. The number of domestic consumers connected between 1946 and 1952 has been 8,000 out of a total number of

consumers of 12,500, and practically 100% of these 8,000 have water heaters installed.

2. Since 1946, consumers' main boards have been left with leads ready for the installation of the ripple relays.
3. A new tariff, gazetted in 1946, gave the right to the department to refuse the low basic unit price to any consumer refusing the department the right to fix the relay.
4. The adaption, in 1946, of single phase services, and encouraging the use of the E.D.A. unit.

Figs. 4 and 4A show a dimensioned sketch and photograph of a 60-amp. main board capable of serving an all-electric

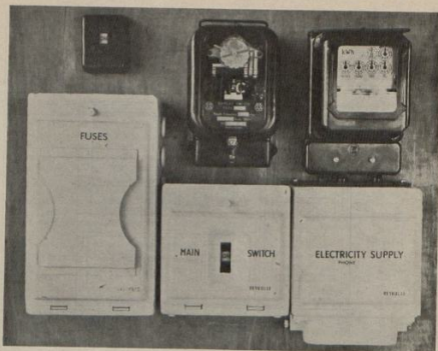


Fig. 4a.

house, and shows the position of the ripple relay.

Consequently, the department, in 1952, had 8,000 points where only a few minutes' work was necessary in order to carry out the installation of the relay.

The department is connecting new domestic consumers, or other premises with water heaters, at the rate of 1,800 a year, so that, ignoring the difficult 4,500 wired previous to 1946, and which have a lesser percentage of water heaters connected, it should be easy to reach the 14,000 relays-installed mark by 1955 or 1956 by only equipping the main boards of those already arranged to accommodate the relays.

The distribution system has mains of the ordinary 3 phase 4 wire type, and the single phase connections to residences are arranged so that there are, as far as possible, the same number of houses on

each phase, thus providing a much better balance in the long run than by giving a 3 phase 4 wire service to each house.

The relays have been divided into three, and each third of the total is set to operate on a different channel. Consequently, by installing equal numbers of the three different settings, it is possible, on the operation of each channel, to shed the load of the water heaters equally on each phase, of each distribution feeder, and consequently on each phase, of each transformer, and H.T. feeder. At the power station, therefore, the water heaters can be shed at the rate of one-third of the total connected at each operation.

### (3) Effect

#### (3.1) Effect on the power station demand

It must be realised, first of all, that over the last winter the department had only 1,400 relays installed, but it is felt



that the results obtained are fairly conclusive, especially the results in substations (q.v.).

It must be realised, however, that the results obtained are so bound up with the habits of the people that I must emphasise that those obtained in Salisbury will not necessarily obtain in any other city.

It was quite surprising how little the department knew about its own load. For instance, the first batch of relays was installed in a new area of 110 houses, fed from one substation. All these houses were occupied by a similar class of people and all were identical in installed electrical equipment. The time of peak load in the summer, when the first test was made, was 6.45 p.m., and the control was operated so as to cut out water heating between 6.15 p.m. and 7.15 p.m. It was found that the drop in load between an evening when the control was operated, from an evening when the control was not operated, was about 1 kW per consumer.

The peak load in winter is at 6.15 p.m., half an hour earlier, so the control was tried again between 5.45 p.m. and 6.45 p.m., with a resulting decrease in the load of about 1.4 kW per consumer.

It was then realised that although the cooking load varied with the sun—that is, people cook half an hour earlier in the winter than in the summer—the time when people use hot water is mainly based on working hours, and is practically static throughout the year.

Due to the fact that Salisbury, even with the ripple control so far installed, could not carry its winter peak without load shedding, it was only possible to carry out tests on alternate evenings with ripple control used and not used up to the time when the power station could carry the full demand of the city, that is, up to the end of May. The results showed that the 1,400 relays installed were reducing the load on the power station over peak by a figure of approximately 1,600 kW in April, and rising to nearly 2,000 kW by the end of the time when these tests could be carried out. It seemed reasonable to assume, therefore, that the effect of 1,400 relays on the winter peak was a reduction of 2,000 kW. This is also borne out by the fact that the maximum units sent out in any week up to

June, 1952, was 21% over the similar week for 1951, whereas the demand at 53,000 kW was only 13% above the previous winter peak.

Due to the fact that load shedding, besides control of water heaters, had to be carried out, this 53,000 kW is only an estimate, but, as the load on the various feeders shed was well known, I think it can be taken as a very accurate estimate.

It has been generally agreed, therefore, that the maximum effect in Salisbury is 1.5 kW per 2 kW water heater. The overall effect per relay, however, is expected to be slightly higher than this in view of the fact that since the winter of 1952 there has been quite a run on electrode boilers, and relays have been attached to some with up to 350 kW loading, with the full consent of the operators.

The department is therefore working on a basis of a final 20,000 kW reduction in load by the use of approximately 14,000 relays. From Fig. 2 it will be seen that this difference between morning and evening load is expected to reach that figure by 1957.

#### (9) Effect on substation demands

The effect on the demand on substations can be demonstrated by the results given on a typical substation, the number of consumers supplied by that substation being accurately known. Also, every house was known to have an exactly similar 20-gallon 2 Kw water heater.

The number in family in each house was almost identical, as they had been built by the National Building and Housing Board especially to cater for families with three children.

The effect was as follows:—

Number of consumers ..	110
Winter demand:	
Unrestricted .. .. .	400 kW
Restricted .. .. .	240 kW
Change in units sold per day between restricted and unrestricted .. ..	+0
Reduction in load .. ..	1.45 kW/consumer

Again I must stress that diversity of habits can easily reduce the difference to as much as only 0.75 kW, as it was found that the higher the social strata

and the higher the standard of living, the higher the consumers' reduction of load.

### (3.3) Effect on consumers

It was with some trepidation that the department waited for the consumers' comments on its audacity to control their supply of hot water, and a great sigh of relief went up when a week went by with no complaints other than from the odd few who had, despite the precautions taken, a faulty relay. The quick replacement, however, usually brought commendation for prompt service.

Consumers were asked if they had noticed any difference in their supply of hot water, and the answer, without exception, was that no inconvenience or change had been noticed.

The reason for the lack of inconvenience is obvious, namely:-

1. There is ample hot water in the storage cylinder to satisfy the early evening requirements of most families.
2. There is ample time for the water to re-heat for their later requirements.
3. There is, of course, no restriction on morning hot water in any shape or form.

There was one complaint, however, that had the possibility of growing to large proportions. This was the radio interference from the operation of the relay.

There was no effect on listeners to local stations, but it was surprising to find how many consumers listened to short wave low intensity stations, and here, to say the least, the effect was very noticeable.

Although the interference only lasted approximately eight seconds, it was most irritating.

However, after considerable research, the necessary smoothing circuit has been fitted, and this complaint has disappeared. I think it can be said, therefore, in Salisbury that the effect on the consumer of controlling his water heater over peak has been unnoticeable.

At times, when the power station has been on maximum capacity in the morning, and some small breakdown has indicated load shedding, the department has been able to get through by the operation of

ripple control of water heaters. Enquiries from consumers have shown that even this was not noticed.

### (4) Other Uses

#### (4.1) Street lighting control

Control of electrical street lighting was originally carried out by the lamp lighter operating a switch on each street lamp. This was changed eventually to one time-switch per lamp for those connected to 4 core underground cables, or one time-switch per run of overhead lighting.

To reduce maintenance and give better control, other methods, such as five core cables, solar clocks, selenium cell actuators and contactors in cascade were used. The latter was the method possibly requiring the least maintenance, but the drop in volts on the street lighting conductor often caused burn-outs in contactors and their operating coils.

Ripple relays can be used to operate all street lighting, either by substituting for the present time-switch and by the operation of street lighting contactors, or direct on to the street lights themselves. One advantage is the lack of maintenance and alteration of time-switches, and another that street lighting can be tapped on to the ordinary main conductor without the need to run back to the main street lighting conductor or contactor.

The same can, of course, be said for a time-switch, but this means added yearly costs in maintenance and the alteration of the time.

#### (4.2) Shop window lighting

It is intended, in the near future, to control shop window lighting by means of ripple control. This will be done on the basis of: the department controls the lighting free, provided the consumer agrees to it only being switched on after peak. This may not be suitable in all towns, but in Salisbury, the number of people who shop window gaze over peak is negligible, for, as I said previously, Salisbury citizens do not stagger their activities, and at "peak" they are at home taking their evening meal.

#### (4.3) Alarms

This is a use for which it is hoped it will never be required, but it is the one for which the original apparatus was



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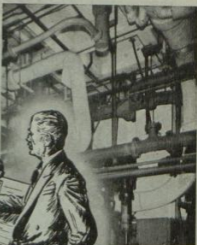
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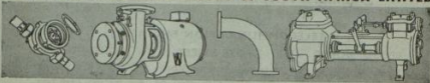
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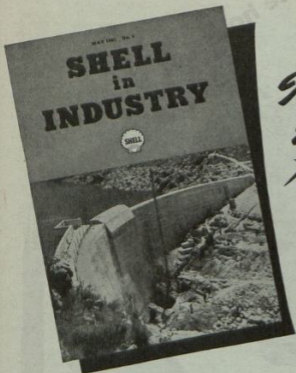
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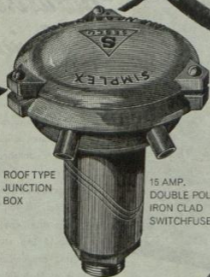
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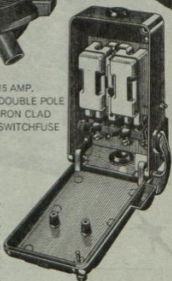
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first designed, namely, for sounding off air-raid sirens in all parts of a city without the trouble of stringing pilot wires throughout. It could, of course, be adapted for other uses, such as calling out firemen, etc.

### (5) Costs

#### (5.1) Cost of central injection equipment

A careful check of the costs of the plant, its erection, the building in which it is housed, testing and commissioning, has been kept. The detailed costs are given below:-

(a) Cost of equipment sufficient to cater for a system load of up to 120 megawatts . . . . .	£8,815
(b) Costs of building to house equipment at power station . . . . .	978
(c) Cost of erection . . . . .	1,463
(d) Cost of testing and commissioning . . . . .	1,420
	<hr/>
	£12,676

It should be noted that the cost of testing and commissioning is considerably higher than anticipated, but is due, in the main, to a considerable amount of research and alteration which was found necessary to obtain correct operation.

The main items of plant are condensers, transformers, high frequency generators, rectifier and contactor gear. As the apparatus is, in fact, only in operation for a few minutes in the day, there seems to be no reason why it should not be given the same economic life as power station plant, namely twenty-five years.

#### (5.2) Cost of relays, testing and installation

The costs given below relate to the 1,700 relays bought, tested and installed up to the end of 1952, and are as follows:-

(a) Cost of relays . . . . .	£7,210
(b) Cost of testing . . . . .	924
(c) Cost of installation . . . . .	2,140
	<hr/>
	£10,274

The cost of testing and installation is again higher than anticipated, but this is entirely due to teething troubles with

the hot wire switch, where quite a number of relays had to be changed and re-tested, but it is not anticipated that this type of expenditure will recur. Even taking this into account, the cost of the relay and testing and installing it has only been £6 per relay.

#### (5.3) Total cost and running expenses

From present experience (which, it is realised, is not very great), it is expected that the relays will not need periodic changing more than once in five years, and it would appear that it should be possible to carry out this work at a cost of approximately 30/- per relay, or £4,200 per annum for 14,000 relays installed. Capitalised at twenty-five years and 5% gives an equivalent cost of approximately £60,000.

The total cost, therefore, to reduce the load by 20,000 kW is as follows:-

Cost of central injection equipment . . . . .	£13,000
Cost of 14,000 relays tested and installed . . . . .	84,000
Capitalised cost of maintenance	60,000
	<hr/>
	£157,000

### (6) Economics

#### (6.1) Cost of equivalent power station plant

I do not think that anyone can say it is an over-estimate to place the price of power station plant today at £60 per kW, even if it were to be an addition to an existing station. The cost of 20,000 kW of plant would therefore be £1,200,000.

#### (6.2) Cost of distribution

Every undertaking's distribution capital outlay will obviously vary in cost per kilowatt due to the difference in load per consumer, diversity, etc., but for undertakings which have done most of their expansion in recent years, and have a low density of consumers per acre, the figure of £50 per kilowatt is not a figure much above the average. The cost of 20,000 kW of distribution plant would therefore be approximately £1,000,000. The amount of capital per kilowatt of demand is therefore around the £100 mark.

and the total amount of capital required for a demand of 20,000 kW is at least £2,000,000.

Comparing this with the figure given in (5.3) for the total capitalised cost of 20,000 kW of ripple control is, to say the least, startling.

#### (6.3) Cost per kVA of demand

I understand that the maximum demand charge made to municipal bulk supply consumers by the South African Electricity Supply Commission is approximately £4 per kVA per annum, and that, as new plant at higher prices goes into commission, this figure will most likely increase.

The cost of ripple control, as given in (5.3), on the basis of £157,000 for 20,000 kW, with a twenty-five years' life at 5%, is 11/2d. per annum per kilowatt. Obviously, for a smaller undertaking, the cost per kilowatt shed will be more than this figure, but there is a wide enough margin between 11/2d. and £4 for at least an investigation to be justified.

#### (6.4) Other savings

There are obvious other savings, such as improved power station efficiency due to a higher load factor, and diminished no-load losses on transformers due to the smaller installed capacities required, but these have so far not been evaluated.

#### (7) General

I feel I should be failing in my duty if I did not reiterate once again that any undertaking which decides to go in for this type of control should try and operate a pilot scheme, either by the co-operation of consumers, or by time-switches, before committing itself completely, so that it may have some reasonable idea of what the effect on the undertaking will be.

I feel also that I should point out that any undertaking that is not well equipped with a good class of meter tester and mechanic, and a fairly well set up test room, may find it considerably more difficult to operate this scheme than an undertaking in which the task of maintaining these relays could be placed on the test room without undue strain.

PRESIDENT: I will now call on Mr. Smith to propose a vote of thanks to Mr. Mitchell.

#### CONTRIBUTIONS TO MR. MITCHELL'S PAPER

*Readers are requested to note that, for easy reference, all contributions to Mr. Mitchell's paper whether these were made at the Convention or communicated later have been collated and recorded hereunder.*

Mr. E. L. SMITH (Boksburg): I wish to thank you Mr. President for this opportunity to propose the vote of thanks to Mr. Mitchell for his very interesting and instructive paper on ripple control.

The paper has been clearly and capably given, and it should be of great interest to all Engineers and Councillors. Mr. Mitchell has shown how tremendous savings can be affected by the introduction of Ripple Control on systems suffering from high peak demands for short periods.

We, here on the Reef are more fortunate in that, due to heavy industries, our local curves are almost horizontal lines from 7 a.m. to 8 p.m. and we have no steep peaks to contend with, the load factors being in the neighbourhood of 60 per cent.

The description of the difficulties of adjusting and the testing of relays should be of value to engineers, but I am somewhat surprised at the great amount of trouble Mr. Mitchell had with the relays; one would expect that new relays could be put into service with very little adjustment.

The provisions made in the consumer's installations for this system of control as far back as 1946 shows that the Author had vision and his long term policy is now paying dividends.

Councillors and Engineers should be particularly interested and should note that for an expenditure of £157,000 a saving of more than £1,000,000 has been effected.

I congratulate the author for a very interesting paper and have much pleasure in proposing a sincere vote of thanks to him.

Councillor ALFRED MARKHAM (Port Elizabeth): Mr. President, I had intended to give a fuller address for the purpose of seconding the vote of thanks to this so excellent paper, but as the Agenda is behind schedule fewer comments should suffice.



Mr. Gripper, our Assistant City Electrical Engineer at Port Elizabeth, has prepared and submitted a written contribution of compliments, comments and queries to this paper which, I understand will not be read at the Conference, but will be published in the Proceedings of this Convention and will prove of value and interest to Readers.

Mr. Mitchell's paper, Mr. President, is of particular benefit to us in Port Elizabeth and may prove to be of such benefit to many more centres in the future, when they in turn consider the difficulties encountered by peak loads.

I speak as a Councillor, and am sure that I voice the opinion of all my colleagues present, when I say that we have found this paper to be most interesting, instructive and of great value! We, as Councillors, do know sufficient about Electricity to realize and fear the implications of the term "Peak Load."

We in Port Elizabeth are in fact at present installing a Ripple Control System, which we hope to have in operation by this Winter, and if there are any other Centres who, like ourselves are experiencing the hardship of brief and high peak loads, we, like Salisbury, would be only too happy to pass on to them the benefit of any experience we may be acquiring by practical application.

We are greatly indebted Mr. President, to Mr. Mitchell for his clear, constructive paper and thank him; may he be granted many more years of continued success and interest in his sphere of such sterling and useful activity.

**PRESIDENT:** The paper is now open for discussion and at this stage I would like to announce that we hope there will be opportunities for further discussions before the close of the Convention, and that anyone who does not have the opportunity of discussing the papers at the Convention is at liberty to put in a written contribution.

Mr. F. STEVENS (Ladysmith): I congratulate Mr. Mitchell on his paper, and further congratulate him for being, I think, the first engineer in Southern Africa to initiate, in a big way, automatic control for improving the load factor of a large electricity undertaking, and again for having the foresight to prepare consumers' installations well in advance.

The practising of some form of load control is something I am sure many engineers on the Reef and elsewhere would like to consider were it not for the apparent task of altering thousands of consumers' installations to enable relays to be installed.

I have in mind the power cuts on the Reef, and the former goodwill enjoyed by the electricity supply industry for maintaining continuity of supply.

Although at Ladysmith we have not been limited in our power demands, nevertheless the usual bulk tariff applies, i.e. so much per K.V.A. of maximum demand plus a unit charge for the energy consumed. This in itself behoves any engineer to maintain as high a load factor on his undertaking as possible.

To enable Ladysmith to do this I interested myself in various forms of Control four years ago, and right at the commencement realized that whatever was done in this connection would more than likely necessitate water heaters being wired back to the meter board. I thereupon had a wiring diagram prepared showing the necessary alterations to domestic installations which we circulated amongst our electrical contractors. The alterations provided for either Ripple, D.C. Bias control, timeswitches or load limiters. Instructions were issued that all new or altered installations had to conform with this diagram or a more recent one. I shall be pleased to show those interested a print of the diagram referred to.

Consideration was then given to the best method of getting old installations altered. This was accomplished by amending the electricity tariff and in doing so offering a big enough inducement to those consumers with stoves and water heaters who were prepared to have the latter automatically disconnected and to meet the expense of the alterations themselves. The idea was entirely successful, for I can safely say that 80 per cent of all the houses, new and old, are now wired for automatic control, and the remainder steadily falling into line.

In passing I would lay stress on three important points. Firstly, provision for wiring both appliances must be made. Secondly, it must be understood that the interruptions take place at times to suit the department. Thirdly, that the right is reserved for installing any type of

automatic device. The reason for the latter is to permit timeswitches or load limiters to be used in thinly populated areas until D.C. Bias equipment is justified.

Following on this, a number of time-switches and load limiters were installed while enquiries were made regarding the cost of a ripple or direct current system. From the information obtained it was obvious that the frequency or ripple scheme required too big a capital outlay, considering there were only about 100 water heaters in use with a potentiality of not more than 1,000 within five years.

By then we had learned to avoid time-switches and decided to split our attention between load limiters and D.C. Bias equipment. The latter had been made available to us for trying out and the results obtained prompted us to instal four sets. A further two are on order.

Now it is not to be imagined that we had no teething troubles, for we had just as many as Mr. Mitchell experienced although of a different nature as you will appreciate, for his scheme operates with A.C. while ours is D.C.

Ladysmith being a big electrified railway centre with rail or earth return you can guess that some funny things happen. For instance, we had the Orange Express travelling north switching off some water heaters while the Blue train going south would switch them on when they should be off, and so on. We overcame this trouble by increasing the voltage and time settings.

The success Mr. Mitchell met with is borne out by our experience, only in our case the results were not so spectacular for various reasons, the main one being that Salisbury has supervised central control which we cannot easily arrange for.

I do not propose burdening you with details and curves, but consider it sufficient proof of what I have just said to mention that our present load factor is over 50 per cent, whereas before it varied between 37 and 41 per cent.

I further concur with Mr. Mitchell in connection with two other aspects.

The one is that the habits of a particular populace have a big bearing on the success of the scheme.

The other that we, too, have been amazed at the very few complaints received from consumers following interruption of supply to the water heaters. In this connection you will be surprised to hear that most of our water heaters are of only 15 Gallons capacity and that the supply is off twice a day for two hours.

In conclusion I wish Mr. Mitchell further success in this field, and I sincerely trust that other Supply Authorities will do the same as Salisbury, which in the end will help in the struggle to meet the electricity demands throughout Southern Africa.

Mr. G. C. THERON (Vanderbijlpark): Mr. President, Mr. Mitchell's paper, is to my mind, particularly valuable in these times of limited power supplies and rising costs of electricity when we are all groping for means of controlling the peak loads without affecting the sale of units.

The town which I represent has operated a centralized load control system since May, 1951, and Mr. Mitchell's paper, with all its valuable information, is therefore of particular interest to me.

In our town, 96 per cent of all consumers are domestic consumers, of which 75 per cent have electric water heaters of 30 gallon, 2 kW capacity. By controlling this water heater load it was possible to improve the monthly load factor of the system from 35 per cent to 55 per cent. The advantages will be clear to all, but in hard cash it means a nett saving on maximum demand charges of approximately £4,200 per annum with the present installation.

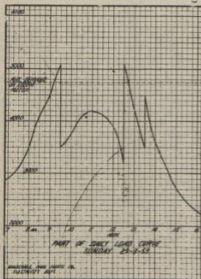
Mr. Mitchell states that the decrease in load by operating the control for one hour during a Winter evening was 1.4 kW per consumer. This appears to be exceptionally high. The best we could ever obtain was a load drop of 35 per cent of the total installed water heater load.

I think the apparent discrepancy can be explained by the difference in living habits of the Salisbury consumers compared with those at Vanderbijlpark, where the bulk of the population are factory employees, and also by the smaller capacity heaters installed at Salisbury. With the smaller storage capacity more heaters would be switched on to the

system at any particular instant and at the peak load period the drop of load would consequently be greater.

The fact that with the Salisbury installation the load can be restored in three steps is certainly of great advantage.

Our experience is that after a shedding period of 2 to 3 hours the returning load is at least twice as much as the load shed.



I have here for publication in the proceedings a load curve taken on a Sunday, the 29th March, 1953, when the weekly peak is reached. It shows the load shed in one step at 9:30 and the load restored in two steps at 12:30 and 1:30 p.m.

Mr. Mitchell's remarks regarding the effect of water heater control on consumers are most interesting and confirm our own experience during the summer months, when the equipment is used as it was intended to operate. Unfortunately the Rand area is in the throes of a general power shortage and during the winter, in order to keep our power demands within the maximum demand limits set by the Electricity Supply Commission, we often have to shed load to an extent of 40 per cent. This means that the water heaters are switched off at 7 a.m. and remain disconnected until 8 or 9 p.m.

As can be imagined the consumers are not so happy about this state of affairs and numerous attempts have been made to interfere with the operation of the relays. This interference ranges from the crude knocking method to the more refined procedure of actuating the operating galvanometers by means of an external permanent magnet. But as in times of war, all new weapons are soon countered with new defences, and by placing a soft iron plate inside the bakelite cover of the relay, the permanent magnet threat has been overcome. I hope Salisbury will never be in the same position as many Reef towns but it will be interesting to learn if Mr. Mitchell has experienced any unauthorized interference with the relays.

I was particularly struck by Mr. Mitchell's description of the testing of the relays and injection equipment. From the figures quoted, the cost of testing the injection equipment and 1,700 relays amounted to £2,344 which, to my mind, appears very high.

Perhaps the author could enlighten us whether this is entirely due to teething troubles of a nature which should have been overcome in the manufacturers' laboratories, in which case I feel the suppliers should foot the bill, or whether these troubles are due to peculiarities of the Salisbury distribution system.

Did the suppliers slip up on their calculations of the characteristics of the system, or can these difficulties only be ascertained by trial and error methods in which case high testing costs can be expected in any other town where a similar system is installed?

Could the author also enlighten us regarding his experience of lightning surges on the consumer's relays and how such conditions would affect his estimated maintenance costs.

From the last paragraph in the paper it would appear that the relays are rather complicated and that the testing requires the services of really first class meter mechanics. Is it not possible for the manufacturers to supply a complete testing set which would simplify the testing of these relays?

Information by the author on relay failures after commissioning, but not due to lightning or mechanical damage, would also be very valuable.

In conclusion I wish to thank Mr. Mitchell for a very interesting paper which will be food for thought for many of us.

Mr. C. G. DOWNIE (Cape Town): Mr. President and Gentlemen, I have studied Mr. Mitchell's most informative paper with considerable interest as, on my recommendation, after the scheme had been under consideration for many years, the Cape Town City Council has recently placed an order for a ripple injection equipment and 5,000 relays for installation on a section of Cape Town's electricity supply system. It is pleasant indeed to learn from Mr. Mitchell's paper that so many people seem to be of the same mind at the same time in Salisbury, and if this happy state of affairs could be emulated in other spheres life indeed would be more rosy.

The result, however, is apparently not so happy when considered in connection with the peak demand on Salisbury's electricity supply system and although we may not be so unanimous in Cape Town we at least have a somewhat better load factor as a result.

The need for means of reducing the peak load of electricity supply systems with load characteristics such as those experienced in Salisbury and Cape Town, and thus delaying the installation of additional generating plant by making the most of existing plant, becomes all the more urgent in view of the high cost of generating plant today and of the scarcity of capital for purchasing such plant. It may be of interest to know that the capital cost of the Cape Town City Council's Table Bay Power Station, which was recently completed by the installation of the fifth 40-MW turbo-alternator set, has worked out at £23 per kW, whereas a new power station at present-day costs would start off initially at something like £100 per kW and average out finally at not much less than £70 per kW.

#### *Shape of Load Curve*

A marked difference occurs in the shape of the load curve in Cape Town from that illustrated in Mr. Mitchell's paper. In Cape Town three pronounced peaks occur daily, the midday peak usually being the greater in summer and the evening peak the higher in winter. With this type of load curve, dropping the water heater load could be done three times per day and thus effect a pronounced improvement

in power station operating conditions, the difference being most pronounced in the boiler house where, with large units, difficulty is experienced in following the steep rise and fall of load. From the shape of the Salisbury load curve there would appear to be little justification for load switching at times other than at the evening peak.

#### *Size of Injection Plant*

The rate of increase in the demand for electricity in Salisbury is certainly phenomenal and I sympathise with Mr. Mitchell in the difficulties he must be experiencing in matching available plant and mains with this very rapid increase.

It would be interesting to learn what tests have been made to confirm that the size of the injection plant which has been installed will be suitable when the system demand grows, as is expected, to 110 MW in 1957; has the attenuation of the injected ripple at distant parts of the system as it exists today been measured, and if so with what results?

#### *Relays and Tests*

It is somewhat disconcerting to learn that factory matched relays were in fact not so well matched and that a special technique had to be developed for testing and adjusting relays before putting them into service. As there is only one central injection plant in Salisbury it would appear that it was necessary to employ relays in order to obtain selected grouping, whereas in Cape Town the grouping will be obtained by sub-division of the system into 30 MW areas, each of which will ultimately have its own injection plant.

The latter arrangement will permit the use of thermal relays employing a much broader and less critical code and in consequence accurate matching of the relays should not be necessary.

A statement is made that the cost of testing at the commencement turned out to be considerably higher than anticipated, due in the main to a considerable amount of research and alteration which was found necessary to obtain operation. It would be interesting to know whether this applies to the plant as a whole or to the relays in particular and what the main difficulty was.

It is also noted that the final method adopted for testing relays employs an electrically-maintained tuning fork and

time interval meter which allows more accurate setting of hot wire switch gaps. Again it would be interesting to have further details regarding this method of testing.

In conclusion I must congratulate Mr. Mitchell on his most excellent paper and wish him every success in the future operation of the injection plant in Salisbury.

Mr. F. P. W. HALL (Somerset West): Mr. President, Gentlemen, I congratulate Mr. Mitchell on both his excellent paper and his astuteness in persuading his Committee to allow him to spend the money on the scheme. Some years ago I became interested in off peak control and found the Americans in Chicago and other Western cities were using a fairly high frequency ripple control from major substations.

It cost about £7 10s. 0d. per consumer and was economically suitable for loads of 2,000 consumers upwards, but was uneconomical for smaller loads and required skilled maintenance.

The difficulty was in finding an alternative reliable and economic system applicable to small towns. The magnetic load limiters were tried and condemned because of the hum. The third wire system was then tried with series latch-in contactors, both with and without time lag relays, but the contactors usually burned out by hunting.

I have now in use series magnetic contactors but am changing to contactors with a spring make control and magnetic pull-off as this gives greater reliability of supply. In other words the magnet is only energised for the period of the peak, approximately 1 hour per day.

The third wire system allows for the fact that consumers with faulty thermostats, badly lagged tanks, pipes and leaking taps, blame the electricity department for high consumption or blame their three-phase meters.

I reasoned, therefore, that the third wire system giving two phases and neutral per domestic consumer, with one meter for the water heater and 1 25/50 amp long range meter for the house, was the ideal solution since the water heaters load ranged between 1 and 9 KW per consumer in my area. It has the advantages of simplicity and gives better voltage regu-

lation to the house owing to the extra copper in use: control is by maximum demand ammeter with a special timer relay to prevent hunting.

Finally, it occurs to me, that provided the water heaters are of large capacity, and of the push-through type, say 40/80 gallons and with large heaters, the necessity for all this complicated control may disappear since the tank thermostats may switch off before the heavy cooker load comes on.

Drip feed tanks could not be used as they have the same characteristic as the domestic refrigerator.

Mr. H. J. GRIPPER (Port Elizabeth): Mr. President and Gentlemen, Mr. Mitchell is to be congratulated upon his courage in presenting this paper to the Convention while he is virtually still in the early stages of the operation of his centralized control equipment. The subject matter of the paper is undoubtedly of considerable interest to electricity undertakings throughout Southern Africa for it has covered ground which is comparatively new in this part of the world. For this reason the paper will be of interest not only to our Engineer members but also to Councillor members.

I am inclined to think the author has been somewhat over-cautious in stressing the fact that the conditions which he describes are not necessarily applicable to centres other than Salisbury. The main features indicated in the Salisbury Load Curve is the evening peak which is experienced there, while in areas more highly industrialized the evening and midday peaks are very often similar, and in the case of Port Elizabeth we have experienced a maximum peak at noon for some considerable time.

Circumstances change in any undertaking and when the consumers commence to live further afield from the centre of a city there is more tendency to take hot meals in the evening and a lighter meal at midday. This will affect the peak and cause it to move over to the evenings. I do not entirely agree, however, with Mr. Mitchell's statement that the Salisbury public are unique in doing the same thing at the same time and, further that the fact that Salisbury is a financial centre and the seat of Government is likely to stabilize their load curve to any extent.

It is appreciated that shift work cannot be encouraged by tariff inducements when electricity forms such a comparatively low proportion of a factory's working expenses. Nevertheless, there will be more tendency to adopt shift-working with the almost inevitable increase in the cost of power in future for installations which have a poor load factor.

The important advantage of centralized control of loads such as those imposed by water heaters, in the form described in the paper, arises from the fact that, whenever the peak load occurs, some degree of control can be exercised irrespective of the time of occurrence of that peak.

While on the subject of the type of load curve and the class of appliance which may be controlled, I should be interested to know whether Mr. Mitchell has considered the question of switching off pumping loads where pumps are used to fill reservoirs, also certain other types of off-peak loading such as battery charging, etc. Mr. Mitchell appears to dismiss "space heating" although I consider that this type of load might very well be controlled in areas where the climate requires the heating of larger buildings.

I should be glad if Mr. Mitchell would give his experience in regard to the contact made by the vibrating element on his relays and whether this contact remains clean and effective during the periods when the relay is non-operative.

Have tests been made in Salisbury to ascertain the maximum area over which the ripple can be detected in sufficient strength to operate relays? I understand that the Salisbury network is interlinked with the Rhodesian Electricity Supply Commission's system and should be interested to know whether the ripple has been detected on points in that system.

I understand that the makers of the equipment supplied to Salisbury also manufacture a type of relay which has a thermal characteristic and does not depend upon the operation of a synchronous motor. Has Mr. Mitchell made use of this type of relay? In Port Elizabeth it is proposed to use the thermal type for all the water-heating loads and to reserve the motor-operated type only for special applications and possibly for street lighting. It would appear that the thermal type of

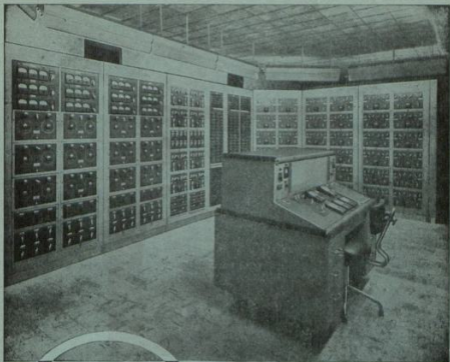
relay has an inherent property of spreading the switching operation over a band for at least a few seconds, and this might have overcome Salisbury's need for using two or three channels on their motor-operated relays to spread the effect of switching large numbers of water heaters on and off.

Mr. Mitchell is to be envied and congratulated upon the layout of his consumer's meter board. Of course his undertaking is young in comparison with many of ours in the Union where we have to put up with meter boards and service equipment installed long ago and not arranged as conveniently or as neatly as the board illustrated in the paper. I note that Salisbury gazetted a special tariff giving the Electricity Department the right to refuse a low basic unit price to any consumer who would not agree to the installation of a water heater control relay. In the Cape Electric Power Ordinance, provision is made for temporary cutting of supply where required for any reason such as maintenance or for improvement of the efficiency of the supply. Based upon this Ordinance, the Port Elizabeth City Council promulgated recently a supply regulation reading as follows:-

"It shall be a condition of supply that the Supply Authority may require disconnection for limited periods or the temporary lessening of the supply of electricity to storage water heaters, air and space heaters, battery chargers, water pumps used to fill reservoirs or any other apparatus the continuous or timely use of which is not essential for the reason that on resoration of the full supply, the normal functions of such apparatus was not impaired."

It is interesting to note that Salisbury have found it possible to control some comparatively large electrode boilers by means of the ripple system. I should be interested to know whether the amount of heat or steam storage in these appliances is found to be sufficient to permit shutting down for a period of an hour or more?

In view of the fact that our peak load in Port Elizabeth occurs at noon or, to be precise, at approximately 11.50 a.m. I should be interested if Mr. Mitchell could state how much relief was noticed in Salisbury when they operated their equipment during the morning load.



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The section of the paper dealing with consumer's reactions is particularly interesting and I should like to have Mr. Mitchell's opinion as to the assistance which the local press was able to give in this connection. Some consumers are notorious for their non-co-operative attitude, but in general I believe that excellent consumer relations can result with advantage to all concerned if mutual confidence and co-operation is enjoyed between the Department and the local press.

It would be interesting to know how Mr. Mitchell asked his consumers if they had noticed any difference in their supply of hot water and how he obtained the answer quoted, assuming it was truly representative. Under circumstances of this nature it is usually the disgruntled consumer only who approached the Department of his own accord. In Port Elizabeth while we have been installing relays recently, prior to installation of the injection equipment, there were some consumers who objected to the apparent interference with their water heater installations while there were others who, having no hot water throughout the weekend and a public holiday, left it for a day or two before notifying the Department, adding that they did not wish to "trouble us over the week-end!"

It is understood that the type of equipment installed in Salisbury provides for some twelve operations to be performed by the relays according to various settings and signals. I should be interested to know whether Mr. Mitchell has experimented with the use of two relays installed in such a manner that one "unlocks" a circuit for a second relay to be operated by a follow-on signal, thereby possibly providing other channels for special purposes. It is appreciated, of course, that the second signal in such a case must be one which will not cause other relays set to the same signal to be operated in a different sense.

I am particularly interested to note Mr. Mitchell's figures and estimates regarding the saving to be effected by the installation of this equipment. These figures bear out very much the opinion which I hold concerning the probable saving to be effected in Port Elizabeth. In our case the kVA likely to be charged by the

Electricity Supply Commission for a supplementary supply in the next few years may be of the order of 26/- per kilowatt per month and, consequently, the savings here should be very considerable and it may be assumed that charges of this nature are likely to apply in other centres whether supplies are purchased or generated from new plant installed at today's high capital costs.

Members will be indebted to Mr. Mitchell for pointing out the need for establishing a well-equipped test room properly staffed with efficient personnel having some training and knowledge for the operation and testing of this type of equipment. So often the great savings of a scheme of this nature are stressed to such an extent that disinclination results in any attempt to perfect the system if a comparatively small amount of money is found to be required at a later stage for such purpose. Any attitude of this nature is, of course, regrettable and has too often been the cause at the back of some tendency to belittle a scheme, albeit it may have shown very considerable savings in the long run.

There is one small point which has come to our notice already in Port Elizabeth and that is that a relay installed on a board on which the consumer's doorbell has been erected, is liable to be operated by the "buzzing" of this bell. With the motor type relay this may set the relay off although it is unlikely, of course, to simulate an actual operation.

It is to be hoped that other undertakings who have made some tests or investigations in connection with load control will be able to contribute their experience during the discussion on this most interesting and valuable paper. I have in mind that Grahamstown Municipality installed remote control some time ago on the DC Bias system, while Worcester Municipality installed a form of water heater control by means of "latching" type contactors situated in substations throughout the town; but they were fortunate in having a system of pilot wires available, together with a spare wire for connections with individual consumer's installations resulting from their change over from 3-wire DC services to single phase AC ones.

Mr. C. L. DE BEER (Johannesburg): Mr. President and Gentlemen, Mr. Mitchell has put forward an extremely sound case for the use of some form of centralised control of water heaters to reduce peak loads and improve load factors without inconvenience to the individual consumer.

This method of load control is, in effect, the summation of the load curves of individual consumers to give the supply authority's load curve, and then the lopping off of any undesirable peak by disconnecting, without further reference to the consumer, a selected type of load.

It will be of interest to the members of this association that while the same problem, i.e. peak loads, exist in the Scandinavian countries, they have adopted a very different solution. According to my informant, they base their load control methods on the fact that if each consumer's load curve is brought to a reasonably horizontal line, the sum of the load curves, i.e., the supply authority's curve, will be reasonably horizontal, so achieving the desired object.

It is moreover considered that the best method of achieving this aim is to ensure that the consumer who improves his own load factor reaps the resultant financial benefit.

The manner in which this is accomplished is the installation of two meters or a dual meter per consumer, the first meter being the standard kWh unit known to all members of this association, while the second is a similar unit but with a built-in adjustable cut-in switch so arranged that this meter records only units consumed when a predetermined kW demand is exceeded. The setting of this kW demand switch is governed by the "fixed charge" section of the consumer's account and while the standard rate is applied to the reading on No. 1 meter a penalty charge is made on all units recorded on the No. 2 meter. It will be appreciated that this penalty charge can be varied either seasonally or in accordance with the supply peak and is thus a very potent weapon in the hands of the supply authorities to ensure that defaulting consumers are made aware of the necessity for reducing their peak demands.

This method of load control has a very much wider scope than the control of a single item of equipment even if this item

is so universally adopted as are water heaters in Salisbury, and it will be noted that by changing our present conception of maximum demand as a peak kW reading to the kWh consumption when the load exceeds a predetermined kW figure, the Scandinavian arrangement can be applied for purposes other than peak-load control.

I regret that I am unable to give any figures to support the statement made by my informant that the foregoing line of approach has yielded excellent results in the Scandinavian countries, as the details recorded above were given me only a few weeks ago by a prominent Norwegian. The method must, however, have been successful as I was simultaneously advised that as a result of the above method of load control, there is now available on the Scandinavian market such equipment as load indicator buzzers which give aural indication when the pre-set normal maximum is reached so that the individual consumer can select for himself the equipment to be disconnected to avoid payment of penalty and, moreover, electric heat storage cookers of the well known AGA anthracite type are being produced on a commercial scale.

In conclusion, I would like to refer to the Presidential and valedictory addresses of your two past presidents in which very great stress has been laid on individual rights and responsibilities, and I would suggest that the method employed by the Scandinavian supply authorities of leaving with their individual consumers the right of connecting whatever apparatus they require at whatever time they desire—at the same time bringing home to them by economic means, their responsibility for keeping their load factors as high as possible—is very definitely in keeping with the recommendations of the above addresses.

Mr. A. FODEN (East London): I think, up to now, most of the discussion has hinged on water heaters that have been registering current through the meters. I would like to ask the author if the water heaters at Salisbury register the units consumed directly through the meters? The reason I ask is that we, at East London, have our water heaters connected before the meter and we charge a flat rate, consequently, our load factor

during the night shift is quite a good one. I am just wondering why Salisbury has allowed such heavy loadings—2,000 watts—against a low loading water heater that is on continuously throughout the day. I would like to ask Mr. Mitchell is it due to climatic conditions? We, at the coast do not suffer the severe change in temperature; consequently we can have the low loadings somewhere in the region of 700 or 800 watts against the 2,000 watts that Mr. Mitchell refers to in his paper.

Mr. R. W. KANE (Johannesburg): Mr. Mitchell was foolish enough to say that he might answer a few questions. My query has nothing to do really with the main body of the paper, which I find very interesting; and I think he is to be congratulated on giving us such a very interesting subject.

I notice that he referred to the use of the E.D.A. unit—that is the control equipment that is normally provided on the average service board. A number of us have been interested in this for a number of years; and I think provision has been made for similar units in the second edition of the Wiring Regulations. But what really intrigues me is how he comes to satisfactory arrangements with the local contractor. But on the one hand, you have the equipment—purely and simply the municipal equipment; on the other hand, you have got the distribution board—the main switch, which is normally supplied by the consumer, through his contractor. I am wondering whether he entered into competition with the contractors, or whether he really gives the goods and material away.

Mr. MITCHELL'S REPLY TO CONTRIBUTIONS ON HIS PAPER: Mr. President, contributors to my paper, and gentlemen: In reply to Mr. Smith's very generous vote of thanks, which was so ably seconded by Councillor Markman, and to the discussion which ensued, may I say that I was first of all very pleasantly surprised at the reception given to the paper, and secondly, I confess that I had not previously obtained information about apparatus with similar functions already installed and operating in other towns in Southern Africa, and was especially pleased to hear of the results obtained

in Ladysmith as given by Mr. Stevens, with a load factor of between 37 per cent and 41 per cent improved to over 50 per cent which, as can well be imagined, must have saved that town almost the cost of the installation plus the electrical Engineer's salary in the first year.

In regard to Mr. Foden's contribution, I was quite surprised to see this method of connecting a water heater on the incoming side of the meter; and also I was quite surprised to see the low loading. I know that low loading is very nice for the system but, with a family of four or five all bathing at round about the same time, I am afraid it does not heat up quickly enough, unless you have a very high water capacity. We find that the 20 gallon capacity heater with the normal element does get enough heat in a short time for people to get an extra bath; for instance, we find that people bath about six o'clock in the evening, and often quite a number at ten o'clock in the evening, and there is quite enough time between the ripple control period and the late evening period for enough hot water to be supplied; whereas I think a 1 kilowatt element on a 20 gallon water heater would take something like six hours to come up to temperature.

Mr. Kane mentioned the standardization of the E.D.A. unit and asked how the department managed to get consumers to fit that type of apparatus. What the department did was to call for tenders for the supply side of the E.D.A. unit, and when those tenders were received, the department wrote to all contractors stating that the lowest tender received for the portion of the E.D.A. unit required by the Supply Authority was "so much" and that where a contractor would, in future, supply the whole E.D.A. unit the department would pay that contractor the amount equal to the lowest tender for that portion of the unit. In other words, if the E.D.A. unit cost about £6 to supply and the portion normally supplied by the department was priced at 30s, then, when the contractor installed a whole board, the department would give him a requisition for the 30s, and the E.D.A. unit would be put in as one complete job. This would mean that the contractor could get his E.D.A. units from any of the normal suppliers, because they are all built to the same jig.

In reply to certain points made by Councillor Markman on behalf of Mr. Gripper, I should inform him that in Salisbury the specification for, and the installation of motors for all water schemes is carried out by the department, and the capacities of the pumps are so arranged throughout the scheme to allow for off-peak pumping of water. Co-operation between the City Engineer's department and the Electricity department is extremely close in the design of such schemes.

With regard to space heating of large buildings, this fact is being borne in mind, but no cases have arisen as yet where ripple control of that load would benefit the peak load of the undertaking for it should be remembered that although Salisbury experiences cold nights there are very few cold days during the hours when the buildings are occupied.

The thermal type of relay was not favoured, for, with the 20 MW drop of load planned, a greater spread and split was thought to be necessary. It is agreed that where the network requires two or three injection centres this type of relay might serve some very useful purpose. For Mr. Gripper's information, the operation of the equipment in the morning gave approximately 50 per cent of the evening results, but this is possibly due to the fact that a great number of homes in Salisbury are empty during the day, due to a preponderance of working wives.

With regard to consumers' complaints, it is well-known that it is a common thing for consumers in Salisbury to ring up the press at the slightest provocation and therefore, in a matter of this nature, no news is good news.

Mr. Downie asks a question in regard to the size of the injection plant and the attenuation of the signal. The department is satisfied that the injection equipment will meet a load of 120 MW as it is found to be scarcely more than half loaded now with a maximum load of 60 MW, but with regard to attenuation, some difficulty has already been experienced on the 33 kV network, possibly due to losses in the various transformations. The manufacturers are carrying out a further test at the moment on this matter, and as soon as further results are known I hope to let Mr. Downie have this information personally.

Mr. Downie asks whether the extra cost was incurred in extra tests on relays alone, or whether a certain amount of this expense was in testing the injection equipment, and I have to inform him that there was a certain amount of expense involved in testing the injection equipment, mainly in the nature of a research which could not be carried out by the manufacturers except on a definite distribution system.

I was very interested to hear the results obtained in Vanderbijlpark, as given by Mr. Theron, and the reason why he obtains lesser load shedding for relays attached to the same equipment there, as against that obtaining in Salisbury, seems entirely due to the difference in the habits of the people, as a considerable number of the population in his town work on a shift basis. I should imagine, however, that if the ripple control was operated in Salisbury in a similar manner to that operated in Vanderbijlpark, the local press would have to bring out a special edition to publish all the letters of protest, and I can also assure him that we have no tampering with the relays, such as described by Mr. Theron as taking place in Vanderbijlpark.

For his and other engineers' information, I can say that up to the present lightning has not damaged a single relay, possibly because they are in plastic cases.

Mr. Theron asked about the cost of testing. A large proportion of the cost was involved in ensuring adequate radio interference suppression: we had quite a lot of radio interference at first, which has now been overcome. Mr. Gripper, as a matter of fact, raises that point in a different way in his discussion, in that he asks whether bell buzzers actually operate the relays. In some earlier instances that did happen, due to the fact that the arc caused by a contactor on the mains—not on the 6 volt side but on the 230 volt side—does cause quite a wide wave-band which can operate the 605 cycle reed balancer contact.

I was interested in the comments of Mr. Hall and especially in noting that he has already used various systems for load limitation in Somerset West. I think I could agree with them that, for a small town, possibly the third wire would be ideal, although I am not so certain, without going into the matter thoroughly, whether it would not be much more

expensive than the D.C. bias system. It would, however, be very much more expensive in a City such as Salisbury with over six hundred sub-stations.

It was very interesting to hear of the methods used in Sweden, as instanced by Mr. de Beer, but in Salisbury, with the master of the kitchen usually being a native, I doubt whether any such method could be applied, and I am perfectly certain that the over-consumption meter would record just that number of units that was necessary to give the occupier of the house exactly the same use of electricity and that he has today without control of his water heater. This means that if the consumer is willing to pay, the load on the power station will not alter in any way whatsoever and the control is left with the consumer instead of the Supply Authority.

As I have endeavoured to emphasize throughout, with the installation of this system, as far as it has been applied in Salisbury, it means that the Supply Authority can restrict the demand on the power station without the consumer himself being even aware that any restriction has been applied.

I should like to thank the President and all Members of the Association for the very sympathetic and attentive hearing they have given to my paper, and to all those who contributed to the discussion as, from my point of view, I found all the contributions did, in fact contribute something additional to the paper and were not merely comments on it.

**PRESIDENT:** Mr. Mitchell, may I once again say how indebted we are to you for presenting this paper. I consider it has been of great interest and value to Engineers. May I also thank those Engineers and members who have taken part in the discussion.

#### THE ENGINEERS FORUM

**Mr. C. KINSMAN (Durban):** This innovation was introduced by the Executive so that an opportunity might be given for discussions on topics which, while being of everyday interest to Municipal electricity undertakings, might not justify formal papers. Members were invited to submit questions some weeks prior to the Convention and the response to the invitation was very gratifying. The questions were

arranged in order of priority by the Executive, who appointed Mr. C. Kinsman (Durban) as Question-master.

**Question 1. Mr. W. G. THACKWRAY (Kokstad):** "What might be the cause of a honey-combed area developing in each of the cylinder liners of an 8-cylinder diesel engine to the extent that water was admitted to the cylinders?"

**Mr. W. H. MILTON (Electricity Supply Commission)** offered a possible solution and, in addition, the President undertook to put Mr. Thackwray in touch with someone who would probably be able to assist in solving the problem.

**Question 2. Mr. A. R. SIBSON (Bulawayo):** "What is the general practice in (a) larger towns and (b) smaller towns in relation to requests by individual consumers for the shielding of street lamps to avoid their shining into bedroom windows?"

**Messrs. FODEN (East London), KANE (Johannesburg) and MILTON (Electricity Supply Commission)** contributed to the discussion from which it would appear that the general practice is for municipalities to shield only those lamps which are on the same side of the street as the applicant's house. In East London lamps are shaded only on the production of a medical certificate.

**Question 3. Mr. VAN DER WALT (Krugersdorp):** "In financing the reticulation of new townships not belonging to the Council which of the following methods would be recommended: (a) the owner to lend the money to the Council, free of interest, and the Council to repay the owner on a formula of assumed payability; for example, five times the revenue received, less any previous refunds; (b) the second alternative: the Council to raise a loan and the owner to guarantee the Council a minimum revenue to cover loan charges; (c) the third alternative: the owner to lend the money to the Council, free of interest, for a fixed period, say ten years, and the Council to repay this loan in ten equal instalments.

A similar question was submitted by **Mr. MATTHEWS (Uitenhage).**

**Messrs. MILTON (Electricity Supply Commission), KANE (Johannesburg),**

LOMBARD (Germiston), TAINTON (Springs), DOWNIE (Cape Town), HALLE (Pietermaritzburg), DUNSTAN (Pretoria), ATTERIDGE (Somerset East) took part in a most interesting discussion.

In regard to the financing of extensions it appeared to be the general practice for the township Company to find the money in the first instance although in Pretoria the policy was stated to be that the Municipality provided the capital.

In the matter of repayment of capital to the Companies who had provided the capital in the first instance, it appeared that the general practice was for municipalities to refund the capital on a "payability" basis i.e. to make refunds on the basis of four or five times the annual revenue derived from the extension.

In Pretoria, where the municipality financed the extension, it was the policy to require a guaranteed annual revenue from the extension equivalent to 10 per cent of the capital expenditure.

**Question 4.** Mr. VAN DER WALT (Krugersdorp): "Due to the rapid development and continual change in conditions in Electricity Supply Undertakings, is it not advisable to empower Councils to establish Sub-Committees consisting of prominent Engineering minded men and Industrialists? This may be thought advisable due to the fact that only one Electrical Engineer must attempt to convince a number of laymen about development, necessitating large expenditure. The laymen have only got the one adviser and are sometimes inclined to doubt his word."

Councillor S. J. HATTINGH (Germiston), Councillor CHAPMAN (East London), Councillor PIERCE (Graaff-Reinet) and Mr. EASTMAN (Honorary Member) spoke on this subject and the consensus of opinion was that there was no necessity for such a committee because Municipalities always had recourse to Consultants who were experts.

**Question 5.** Councillor H. L. RICHARDSON (Durban): "What departmental charges are made in the various towns for:-

- (a) Rent of pole sites in public streets.
- (b) Rent of servitudes for cables?"

Councillor W. H. HARRISON (Johannesburg) replied to Councillor Richardson's question and the Question-master summed

up the position by quoting that "While figures cannot lie, liars can figure."

PRESIDENT: Thank you, Mr. Kinsman. Gentlemen, as I have no further notices or announcements to make, I declare this Convention closed for today, until 9.30 a.m. tomorrow.

FOURTH DAY  
FRIDAY, 24th APRIL, 1953.

#### EXECUTIVE COMMITTEE'S BULLETIN

PRESIDENT: Members, I would like to announce that your Executive Committee have met all day on Monday and every morning except Thursday since the Convention started, and in due course you will be issued with a Bulletin which will cover the various subjects they have discussed, namely: The Promulgation of Electrical Wiring Regulations, the Registration of Electrical Wiring Contractors, Advertising Rates and Representation at Conferences, Electrical Wiremen and Contractors Act, Committee of Approval for Electrical Products, Importation of Plant and other Requirements, Proposed formation of a National Committee of Municipal Apprentices, Meter Testing Code, Amendments of the Rules and Constitutions, and the question of the Annual and Biennial Conferences.

In connection with the latter item, gentlemen, I would like to announce that your Executive dealt with another letter which was received from the United Municipal Executive of South Africa, mentioning the holding of Conferences by various Associations either annually or biennially. As you all know, this question was raised at the last Convention, and, as indicated here in a number of speeches by Councillors and Engineers, the question is still being discussed by various municipalities. Your Executive has gone into this matter again very fully and it has drawn up a Memorandum, and a letter, which you are asked this morning to approve of, to be sent to the United Municipal Executive. The Memorandum largely deals with the various reasons why we consider that our Conference should be held annually, and points out that, if our Conference is held biennially, it would be a very serious step for us to take. The letter emphasises that I want to state in the letter that I have the approval of this Convention. Generally



speaking, the Memorandum is far too long, gentlemen, but it can be and will be issued with the Bulletin when that is issued.

In the meantime, I would like somebody to propose that this letter and Memorandum be sent to the United Municipal Executive of South Africa.

Councillor L. RICHARDSON (Durban): I propose that the draft letter and Memorandum, as compiled by the Executive, be adopted and forwarded to the United Municipal Executive.

You, Mr. President, have explained the whole matter to the Convention here; and, as you have stated, it is rather a long document to read. We have the unanimous approval of the Executive Council of this draft letter and memorandum, and I have pleasure in moving that the matter be submitted to the United Municipal Executive.

Councillor A. MORTON JAFFRAY (Salisbury): I second that.

The motion was agreed to nem. con.

PRESIDENT: I now ask for nominations for auditors for the ensuing year.

Mr. A. R. SIBSON (Bulawayo): I would like to propose that the existing auditors, Messrs Savory & Co., who have done an extremely fine job during the last year, be reappointed, for the ensuing year.

Mr. C. G. DOWNIE (Cape Town): I will second that, Mr. President. (Agreed to nem.con.)

#### WELCOME TO HONORARY MEMBERS

PRESIDENT: I would like to say that it has been very gratifying to see some of our Honorary Members here. I have spoken to Mr. Eastman, Mr. Horrell and Mr. Rodwell. We are very delighted that these gentlemen are still with us and attend our Convention regularly, and we trust and hope that you will be spared to meet us again at the next Convention.

I have another one to note, and that is Mr. Coulthard. Ladies and gentlemen, I don't know whether Mr. Coulthard is the oldest member of the Association; I have an idea that he is the oldest in age of any of us at this Convention. I think he said he had attended twenty-seven Conventions. Why, that was practically before I was born! (Loud

laughter. Anyway, we are very pleased to see you, Mr. Coulthard and hope that you will be able to be with us next year.

#### RE: BALLOTING FOR OFFICE BEARERS BY CORRESPONDENCE

Mr. V. E. O. BARRATT (Queenstown): Mr. Vice-President, ladies and gentlemen; I would like to suggest that our Executive Committee investigate the possibility of carrying out our ballot for the various positions by correspondence. Throughout these Conventions, we are pressed for time. I have seen people turning over page after page of what they have prepared to say to us for publication in the Proceedings. Often those items that are turned over might have raised very useful questions or suggestions; and, I should imagine that, if we could save that hour which is devoted to the election of Officers by carrying that out by correspondence it would be of great value to this Association.

Of course, there is the question of cost; and I think that any and every Delegate who attends such a Convention would be quite prepared to drop a ten shilling note in the Collection Box for that purpose, when they attend Conventions.

Mr. G. J. MULLER (Bloemfontein): Thank you, Mr. Barratt, your remarks will be duly considered by the Executive when they meet again.

#### CONCLUSION

PRESIDENT: Mr. Mayor, ladies and gentlemen: Perhaps this Convention is no different to many others I have attended. No Convention of the Association of Electrical Undertakings is ever finished. What we have to do, Sir, is to close it; and, today, we are closing another very successful Convention. Many items have been left over, Sir, which we will have to deal with at the next Convention.

Now, my next duty, Mr. Mayor, is to extend to you once again a very hearty welcome for sacrificing time to come to our concluding proceedings. We are indeed, Sir, very, very grateful to you.

It may be of interest to you, Sir, to know that there were 242 gentlemen and 124 ladies registered at this Convention; one of the best Conventions that we have had in recent years.

Mr. E. V. PERROW (Chairman, Safety Precautions Committee and Past President, S.A.L.E.E.) Johannesburg: Mr. President, Mr. Mayor, Ladies and Gentlemen, I wish to thank you and your Council Mr. President for the invitation to be present at this Convention in my capacity as Chairman of the Safety Precautions Committee and take the opportunity of thanking your Association for the assistance rendered to that Committee by its representatives thereon.

Much work has been done in connection with the Standard Wiring Regulations and many suggestions have been received for amendments and these will be given full consideration when the time is opportune for further revision.

Mr. President, I have been asked to express the regrets of Mr. A. R. Mullins, the President of the South African Institute of Electrical Engineers and of Mr. W. B. Hutton, the President of the Institution of Certified Engineers at their inability to be present this morning and to extend to you and your Association the greetings of both these bodies. The Council of the South African Institute of Electrical Engineers was particularly pleased to welcome a number of your members at the monthly meeting of the Institute held in Kelvin House last evening.

In conclusion, may I take the opportunity of wishing you and your Association a very successful year.

Mr. J. W. PHILLIPS (Acting-Chairman, E.S.C., Rhodesia): Mr. Mayor, Mr. President, ladies and gentlemen: On behalf of the Electricity Supply Commission of Rhodesia, I would like to take this opportunity of offering our very grateful thanks for the invitation to send Delegates to this Convention.

Our Chief Electrical Engineer unfortunately had to leave for Salisbury this morning, and he asked me to express his personal thanks for the kindness and hospitality that has been extended to us, and for the privilege of being able to listen to the papers and discussions, that I know will be so valuable to him and to the Commission.

I should also like to congratulate you, Mr. President, on your election to this important office, and wish you and your Association every success in the future.

Councillor A. MARKMAN (Port Elizabeth): Mr. President, Mr. Mayor, ladies and gentlemen: When Johannesburg extended an invitation for the holding of the Convention at Johannesburg, at the last Bulawayo Convention, Councillor Weiner, who then extended the invitation, indicated that, although there would be no sea bathing at the Convention, nevertheless the welcome which would be accorded to us would be a royal one.

Now Mr. Mayor, Mr. President, let me say, without any fear of contradiction, that that promise has been carried out to its full extent; as a matter of fact, so much so that the adjective "royal" was carried out in-so-far as we even saw the "King's Rhapsody."—(Laughter.)

Permit me to congratulate, Sir, His Worship the Mayor upon his hospitality to us and also for having established a country-wide reputation for hard work, energy and consideration to rich and poor alike. I congratulate him—and ask for your permission to do so—upon the manner in which he has carried out his arduous duties. I go further, Mr. President, and congratulate him on his quick thinking at this Convention the other morning, because he actually collared our guest speaker in order to have him present at the establishment ceremony of Queenshaven, in front of the City Hall. But, Mr. President, that was not far enough; he even ordered—and, mark you, I use the word "ordered" advisedly—that this large and important Convention should be adjourned in order that the ceremony should be graced with the very gracious presence, the beaming faces and good looks, of all those present here—(Laughter). But, Mr. Mayor, I would say in all seriousness that we were very happy to attend that ceremony; and I know I express the view of all present when I say that we do hope that the Queenshaven project will be the success which you hope it to be and which it so richly deserves. Now, Sir, I would like briefly to refer to what I consider were certain achievements at this Convention. I consider and know that the valuable exchange of ideas between leaders of Electrical Undertakings in the Union and Rhodesia in no small way benefits the Undertakings as a whole throughout the Union.

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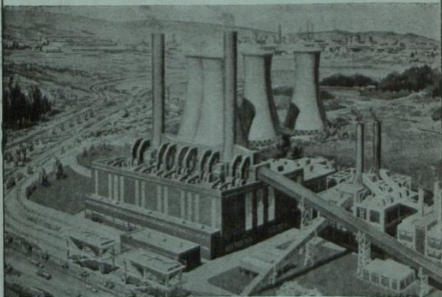
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Another aspect which struck me was the fact that this Convention encourages to no little extent a spirit of goodwill between Councillors and Engineers, a team spirit which I think can but augur well for the future of Electricity Undertakings in the Union. From the Engineers' viewpoint, it perhaps shows their Councillors that their Engineers are even more conscientious and more thorough and energetic than we knew them to be in their own little towns. From the Councillors' view point, it indicates to us that, in fact, although we are cogs in a machine—a machine which I know you Engineers consider is not really a machine but merely a brake, that is to say mainly a brake to curtail all expenditure; although we are cogs in this machine to curtail this expenditure which you consider essential and which we consider extravagant, nevertheless, perhaps you do realize that we as individuals are sincere in our outlook towards these undertakings and sincere too to the amount of energy which you expend towards your civic authorities.

As a matter of fact, what struck me rather markedly at this Convention was the similarity between Councillors and Engineers, not only a similarity in their ordinary outlook but in their appearance; I find that they actually are the same sort of beings—(Laughter). I must congratulate Johannesburg on its sound outlook in not putting on these name tags an indication as to whether we are Councillors or Engineers; the result was that one was addressing Councillors on highly technical matters, as Engineers, and one found that one was confiding in Engineers what one would only have confided in a fellow Councillor—(Laughter). At any rate, may this system of intermingling continue, and may this Undertaking go from strength to strength with resultant indistinguishable differences between us.

Meneer die President, al die besoekers by hierdie Konferensie is dankbaar vir hierdie geleentheid wat hulle gehad het om te help om die uitmuntende werk van die 26 vorige Konferensies van hierdie Vereeniging voort te sit.

Sy Edele die Administrateur het tereg in sy openinge rede gesê „'n Gas van Johannesburg is altyd verseker van 'n aangename tyd.”

Die Konferensie is buitengewoon deeglik georganiseer en ons moet al die betrokkenes hartlik gelukwens—diegene wat ons ontmoet het, asook diegene agter die skerms wat onopvallend hulle werk verrig het.

Ons bedank u vir 'n egslaagde Konferensie en ons wens u Meneer die President, 'n voorspoedige en vrugbare ampsjaar toe—„Alles van die Beste.”

Thanks again, Mr. Mayor, to you, your City Councillors and your citizens, for your very gracious hospitality; and we trust we shall be granted, not only as Councillors in our official capacity but perhaps as individuals, in the various towns which you may visit, the opportunity of reciprocating this hospitality to you, Mr. Mayor, and to any of your City Councillors or citizens.

And I know we express the hope of everyone when we say may this Association represented here today grow from strength to strength with the continuation of its prevailing spirit of goodwill and optimism: and even after it finds it is compelled, due to the development of time, to change its name to the “Association of Municipal Electricity and Atomic Power Undertakings,” may it continue with its annual gatherings. I use the word “annual” intentionally, Mr. President.

And lastly to you, Mr. President, we wish you good health. This we wish you in order that you may carry out the arduous task during your year of office; we know that, if you are granted that blessing, you will carry out your term of office with dignity, conscientiousness and efficiency. Thank you, Mr. President.

Councillor S. W. SANDFORD (His Worship the Mayor of Salisbury): Mr. President, Mr. Mayor, ladies and gentlemen, it is indeed a great honour to have the privilege of expressing, on behalf of the ladies their grateful thanks for the many kindnesses shown to them during this past week. I am sure you will all agree that a Convention would not be the same without the ladies. Unfortunately, many of us were unable to bring our wives with us, but I feel that the presence of so many ladies at the Convention is certainly a restraining influence, and it is very-nice to have them grace our proceedings and our entertainments.

While we have been here busy each day, the ladies have been very well looked after; and I wish to express, on their behalf, their grateful appreciation for all that has been done for them.

I am sure that they thoroughly enjoyed the Mannequin Parade—thanks to Messrs John Orr & Co.

I feel that many of the Delegates would have preferred, rather than discuss the figures or Electricity Tariffs, to have seen the figures of the beautiful mannequins—(Laughter)—draped in lovely unmentionables—(Renewed laughter).

Having been asked to propose the thanks of the ladies, I was very disappointed that I myself did not receive an invitation to this Mannequin Parade. I understand that there was one gentleman present at the Mannequin Parade, but I have not yet been able to find out the name of the Delegate—(Laughter).

On behalf of the ladies, I wish to convey their thanks for the entertainment provided by the ladies of Orlando on Wednesday afternoon, before we continued with the wonderful Cocktail Party and Braai vleis.

I should like to make special thanks to the Mayoress for her kindness in looking after the interests of the ladies during this week, and for affording so much of her valuable time in their interests.

In conclusion, I should like to thank, on behalf of the ladies, the Mayor, the Mayoress, the City Councillors and all the people of Johannesburg for the delightful week that they have spent here in the Golden City, which they will remember for a very long time. Thank you.

Dr. J. T. HATTINGH (Chairman, Electricity Supply Commission): Mr. Mayor, Mr. President, ladies and gentlemen: We would like to thank, first of all, the Mayor for having given us such a good treat during this Convention, and would like to ask him where he bought those beautiful sweets.—(Laughter.)

Mr. President, what struck me mostly at this Convention, during the few days that I have sat here, is the very excellent spirit that prevailed amongst the people here. I think the reason for that was this, there was no bone of contention on which to fight each other; there was just something to fight, and, instead of attacking each other, we attacked that object; in other

words, our attitude was objective. If we in South Africa would remember that, I think, in spite of the enormous progress we have made up to now, we shall progress even still better in the future. I thank you, Mr. Mayor and Mr. President.

PRESIDENT: I will now call upon His Worship the Mayor to conclude our proceedings. But, before doing so, I wish to say that I have been asked by the ladies who have apparently contributed to one or two little things whilst we have been here — I mean financially — to announce that they have found themselves with a balance—which is unusual for a Convention. They have asked me if I would be good enough to hand this balance over to His Worship the Mayor for the Mayoress to donate to the Queenshaven Old Age Home, which the Mayor inaugurated the other day. Mr. Mayor, I ask you to accept this, on behalf of the ladies. (Applause.)

HIS WORSHIP THE MAYOR OF JOHANNESBURG (Councillor H. Miller): Mr. President, ladies and gentlemen, having listened to the words of eulogy which those who spoke this morning have expressed to my Council and myself for the hospitality extended, may I say now that it has been very well reciprocated indeed by the kindness the friendship and the courtesy which the Delegates, and more particularly the ladies have extended to us during their stay here. It is most unusual, I must agree with the President, to have any balances over after the party which the ladies enjoyed; to them I do not really think it was the Convention but the party side of it; but, to have the pleasure of receiving a cheque for a project which our City has started is something unusual, and something for which I would like, on behalf of the Mayoress, to express her most sincere appreciation. I think it was a wonderful gesture and one which can really go down in history at Conferences in its magnificent conception and application.

The Mayoress has also asked me to say to the ladies how delighted she was when she received a very friendly bouquet from them of very beautiful flowers. She says she did appreciate not only the thought but the beauty of their thought which was so well expressed in some very lovely flowers.

Ladies and gentlemen, this Convention has, according to all accounts, been an outstanding success. I can assure you that my Council was very happy indeed to have the opportunity of offering its hospitality and its friendship to men who have come from so far distances to this City in order to debate problems which are of such very great importance to the City of Johannesburg as well as to the other areas from which you have come: and I have no doubt at all that the courtesy which you have paid us in electing our General Manager of Electricity as your President is a courtesy which we do appreciate very much, and one which we feel, in our own humble way, has been richly deserved.

We have known your President for many years; we have known his energy, his devotion and his sincerity; that is why, when I paid him a compliment at the luncheon, I expressed my pleasure not only at his accomplishments but at the fact that he has that tenacity of character and that resolution and determination of purpose which enabled him to persuade a large body of Councillors in this City to accept his rather large plans and his large committal of money.

I may tell you this, Delegates, as a matter of interest, that, of the nineteen million pounds which the City of Johannesburg had assigned to it to spend over a period of five years, no less a sum than 11½-million pounds of that figure was appropriated to the Electricity Undertakings which have been planned by your President. I think that that is a very fine compliment to him.

We are very happy to have had you with us; and, whatever hospitality we have extended, we have done so because we wish to convey to you that we were pleased with your presence here and wanted to offer you some little modicum of relaxation that you may be the better prepared to continue the arduous duties which awaited you at the Convention and the solution of important problems, which I have no doubt have exercised your minds. I trust that, when you return to your towns and cities from which you have come and your countries from which you have come, you will take away happy recollections of Johannesburg, and the assurance that our City is at

all times prepared to lend its weight to anything which is of common value to our country; that our City is at all times prepared to extend the hand of friendship in a mutual undertaking; and that we are at all times ready to give whatever help and guidance may lay within our power to give you in the course of the work which you have undertaken.

I would like to conclude on one note which Dr. Hattings has raised. If we in our country—and I say this even for the benefit of the visitors from other countries—can learn to gather around a table, as we have done here, to discuss our mutual problems objectively and with only one common purpose, and that is to achieve the ultimate success of our own countries in the interests of all their people—if we can gather together with that friendliness and that mutual understanding, and lastly and more particularly gather together as citizens of one country interested only in the development of our country, and nothing more personal than that, I feel that something great and lasting can be achieved to the ultimate benefit of South Africa in the years that lie ahead.

We are particularly happy to welcome our Northern neighbours. I think neighbours are very important; you feel very lonely without neighbours: and in this country, which is part of a Continent, neighbours are most important. We are isolated, in many senses, in this great Continent, because we are at the Southern tip of it; and, if we have such close neighbours on the north as the Rhodesias, we are very happy to have them with us; and I hope that their freedom of entry to South Africa will be consistent with our freedom of entry into Rhodesia, so that sharing as we do many common problems we will be able from time to time without any hindrance to get together in order to solve these problems which are not only common but which I think will probably increase in their importance to both our countries.

Dames en here, Johannesburg is baie bly om julle almal in ons midde te hê. Ons het goed gevoel toe ons van die President verstaan het dat daar sal soveel afgevaardigdes hier teenwoordig wees by hierdie Konvensie. Ons is bly om te hoor dat julle ons gasvryheid geniet het. Ons

is bly om te hoor dat julle Konvensie 'n sukses was; en ek wil net dit sê, dat ons Raad sal altyd gewillig wees om alles in one vermoë te doen om julle te help en om saam met julle te werk in die groot ondernemings waarmee julle moet handel in julle stede en dorps; en ek wil nou net sluit met ons beste wense vir sukses vir julle ondernemings, en ek wil die hoop uitspreek dat julle President, saam met sy Uitvoerende Komitee, sal so'n groot sukses van hierdie aanstaande jaar maak as wat julle in die verlede gemaak het. Alles van die beste.

**PRESIDENT:** Thank you, Mr. Mayor for coming along this morning, and for your words of wisdom to our guests.

I cannot wind up this Convention without expressing my own thanks to, first of all, my Past President, Mr. Sibson, for the co-operation which he extended to me both before and during this Convention, to my Vice-Presidents and members of the Executive and to our Secretary.

I also want to give special thanks to the staff of the Mayor's office, particularly his secretary, Mr. Ellison. He has been of great assistance to me in organising this Convention, and I would like to place it on record, Sir, that we convey to him our sincere thanks.

To the staff of the Electricity Department—there are many, I wish them all to accept my thanks.

To the staff of the City Hall and the City Hall electrician who looked after our loud speaker equipment, I give thanks.

To the Official of the Railway, who has been in attendance here for a week; and, last but not least, the Traffic Officer, Inspector O'Connor, who today told me that he had fifteen tickets in his pocket—(Laughter). If you add those up at 3 months a time, you can imagine how you got off.

The Delegates as a whole, I wish to thank for the extreme courtesy they have shown me whilst I have been in the Presidential chair, and for their patience in listening to me.

Ladies and gentlemen, I now bring this Convention to a close by wishing you Godspeed, and may you all get home safely to your various cities. I say *au revoir*. Tot-aiens.

Convention closed at 12.35 p.m.

## PHOTOGRAPHS

Members attention is drawn to the photographs appearing in these Proceedings in the following positions:—

President 1953/4 between Pages XV and 1.

Group Photograph of 1953 Convention between Pages 2 and 3.

Executive Council between Pages 21 and 22.

Group Photograph of the 1915 Convention which marks the foundation of this Association facing Page 1.

## SOCIAL FUNCTIONS

Although business matters are of primary importance at all A.M.E.U. Conventions there is no doubt that the delegates do look forward to a little relaxation between busy sessions. A change of scenery and a little entertainment provide a welcome variation to the atmosphere of the Conference Hall and afford the delegates an opportunity of meeting and chatting with old friends and acquaintances.

With this in mind, Council and Engineer delegates and their wives, who arrived in Johannesburg on Monday, were invited in the evening to make up an informal party in the Grand National Hotel, to enable them to meet the Executive Council and their other fellow delegates before commencement of business next day.

Following the opening ceremony and preliminary business on Tuesday morning the delegates and guests, numbering more than 500, completely filled up the City Hall at a Luncheon given in their honour by the City Council.

As might have been expected of Johannesburg, the Luncheon was on a grand scale and bore ample testimony to the sincerity of the welcome given to the assembly by the Mayor of the City, Councillor H. Miller, when he spoke at the end of the Luncheon. This was an example of open-handed generosity indicative of the extent to which the City Council was prepared to honour their guests.

A visit to Johannesburg would not have been complete without a theatre show and the City Council appropriately enough invited the delegates and guests to His Majesty's Theatre on Tuesday evening to see Ivor Novello's "King's Rhapsody."



This delightful show was fully appreciated by all 500 odd guests who attended, and most particularly by those who normally have few opportunities of seeing a top class theatrical performance.

On Wednesday morning, while the men were engaged on Convention business, the ladies were enjoying themselves at John Orrs' showrooms viewing the very latest fashions at a mannequin parade. Many of the men would have enjoyed the show too, had they been there, but it was generally agreed that the result might have been detrimental to the necessarily sober tones of the Convention proceedings apart from the subsequent damage to their personal banking accounts.

After lunch, Convention business being completed for the day, the delegates visited the Orlando Power Station Site and the men were given the opportunity of seeing in the course of construction, what will soon be the largest municipal generating station south of the equator. The ladies formed two parties, one of which visited the local Non-European housing scheme under the auspices of the City Council's Non-European Affairs Department, and the other was entertained by the lady members of the Orlando Sports and Social Club.

As evening approached, the parties converged towards the site of the evening's entertainment. This was a charming spot at the side of the lake with the power station looming up impressively through the branches of the trees and the spray from the cooling ponds making an attractive picture in the fading twilight. Here the guests were served with cocktails and snacks. The atmosphere, convivial at the outset, became more so as the band struck up and a hundred electric lights shone from the branches of the trees. A number of braziers were arranged here and there and as darkness fell they glowed and spluttered while the guests grilled chops and boerewors over them. There was dancing on a small concrete floor set amid the trees, and considerably hilarity was evident as the guests wandered to and fro among the braziers.

The weather, considering the time of year, was perfect for the occasion, and it was well after 7 o'clock before the night

chill in the air sent everyone to the warmth of the marquee for hot coffee before departing.

The party with its unusual setting and superb catering arrangements was a great success and the City Council and the Staff of the Orlando Power Station and their wives are to be heartily congratulated on their achievements.

Next day, Thursday, most of the delegates had recovered sufficiently to resume business as usual, but it must be recorded that there were one or two sufferers from sore heads, the blame for which was naturally attributed to smoke from the braziers.

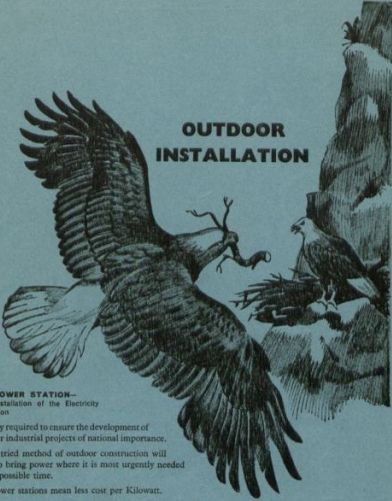
In the afternoon the ladies went for a tour of the suburbs of Johannesburg in a specially chartered municipal bus. The weather again was eminently suitable for the scenery of the northern suburbs to be seen at its best. A stop was made at the Zoo Lake kiosk for tea before returning to the city.

There were no organized arrangements made for Thursday evening and visitors were given the opportunity of selecting their own entertainment from the many offered in the City.

On Friday at the close of business a number of visitors who were able to stay were invited by the directors of the Rand Brick, Pottery and Lime Co., and the S.A. Glazing Co. Ltd., to make a tour of their works at Olifantsfontein and Boksburg respectively.

The guests were taken by luxury buses to the club at Olifantsfontein where they were entertained to luncheon, following which they were taken round the factory where they saw the manufacture of all types of porcelain insulators. Later in the afternoon they were taken to the Boksburg works of the S.A. Glazing Co. where they saw the manufacture of other types of insulators and ceramic ware of all descriptions.

After the tour they were entertained to a cocktail party where they were presented with souvenirs as a reminder of their visit. Both the arrangements and the hospitality were greatly appreciated and the tour made a fitting climax to a memorable Convention.



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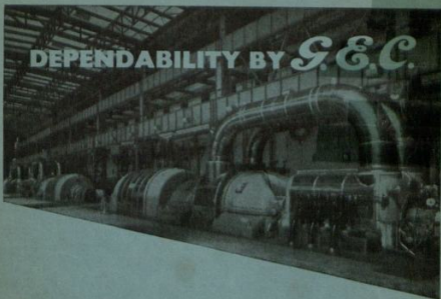
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