

PROCEEDINGS

of the

THIRTIETH CONVENTION

of the

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS

OF SOUTHERN AFRICA

(FOUNDED 1915)



held at

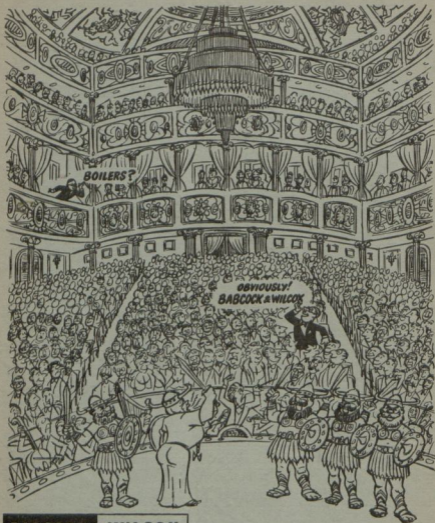
SALISBURY

from Monday, May 7th to

Thursday, May 10th

1956

PRICE TWENTY SHILLINGS



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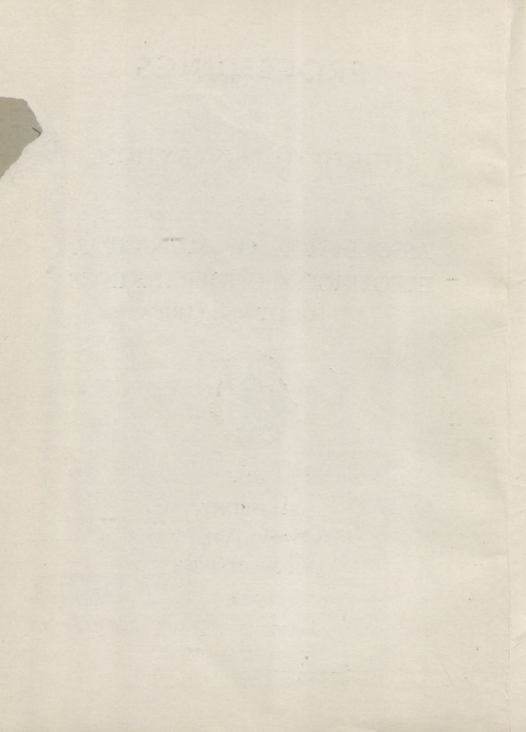
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Printed by Jackson & Co., Germiston, Johannesburg



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EXECUTIVE COUNCIL 1956-57



Front Row (L. to R.): Cr. S. H. Millar (Bulawayo), Cr. P. G. C. Bignaut (Pretoria), D. J. Hugo (Pretoria), J. L. van der Walt (Krugersdorp), J. E. Mitchell (Salisbury) President, G. J. Muller (Bloemfontein), Alderman Morton Jaffray (Salisbury), Cr. J. P. Jonker (Krugersdorp), A. R. Sibson (Bulawayo).

Back Row (L. to R.): C. Lombard (Germiston), R. G. Ewing (Secretary), A. P. Burger (Legal Adviser), Cr. H. Boneschans (Germiston), Cr. M. Spanier-Marson (Durban), R. W. Kane (Johannesburg), Cr. L. P. Davies (Springs), J. C. Downey (Springs), C. G. Downie (Cape Town), Cr. D. J. Marais (Johannesburg), R. M. O. Simpson (Durban), Cr. F. J. C. Castelyn (Bloemfontein).

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EXECUTIVE COUNCIL 1956/57

President :

J. E. Mitchell (Salisbury)

Vice-President :

J. L. van der Walt (Krugersdorp)

*Immediate Past Presidents :*D. J. Hugo (Pretoria)
G. J. Muller (Bloemfontein)*Engineer Members :*R. W. Kane (Johannesburg)
C. G. Downie (Cape Town)A. R. Sibson (Bulawayo)
C. Lombard (Germiston)R. M. O. Simpson (Durban)
J. C. Downey (Springs)*Cities or Towns Represented :*Salisbury
KrugersdorpJohannesburg
Cape TownBulawayo
GermistonSprings
Durban
Bloemfontein (Co-opted)

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

*Secretaries :*Davidson & Ewing (Pty.), Ltd.
(formerly Arthur Tingey, Ewing & Co.)
P.O. Box 7462, Johannesburg.

SUB-COMMITTEES :

<i>Papers</i>	—	—	—	—	—	J. E. Mitchell (President), J. L. van der Walt (Vice-President), D. J. Hugo (Past President).
<i>Tariffs Survey</i>	—	—	—	—	—	R. W. Kane (Convenor), C. G. Downie, A. R. Sibson, J. C. Downey (with co-opted members).
<i>Finance</i>	—	—	—	—	—	R. W. Kane, J. C. Downey.
<i>Recommendations for New Electrical Commodities</i>	—	—	—	—	—	J. C. Downey (Convenor), J. L. van der Walt.
<i>Technical Staff and Man Power</i>	—	—	—	—	—	J. L. van der Walt (Convenor), J. C. Downey, R. M. O. Simpson, H. T. Aspinall (co-opted).
<i>Rights of Supply—Reef Industrial Consumers</i>	—	—	—	—	—	C. Lombard (Convenor), D. J. Hugo, J. C. Downey, J. C. Fraser.

Representatives :

<i>Electrical Wiremen's Registration Board</i>	—	—	—	—	—	R. W. Kane.
<i>Coal Allocation Committee</i>	—	—	—	—	—	D. J. Hugo, R. W. Kane (Alternate)
<i>Safety Precautions Committee</i>	—	—	—	—	—	J. C. Fraser, J. C. Downey (Alternate)
<i>S.A. Bureau of Standards</i>	—	—	—	—	—	J. C. Downey, J. L. van der Walt (Alternate) (with power to co-opt).
<i>S.A.I.E.E. Committee—Code of Practice for Sub-Stations</i>	—	—	—	—	—	C. Lombard.

NOTE.—The President is ex officio a member of all Sub-Committees.

PAST OFFICERS AND MEMBERS OF COUNCIL :

<i>Past Presidents :</i>	<i>Secretary and Treasurer :</i>
1915-17 J. H. Dobson, Johannesburg	F. T. Stokes; E. T. Price
1917-19 J. Roberts, Durban	E. Poole
1919-20 B. Sankey, Port Elizabeth	E. Poole
1920-22 T. C. W. Dod, Pretoria	L. L. Horrell
1922-24 G. H. Swingler, Cape Town	H. A. Eastman
1924-26 J. Roberts, Durban	E. Poole
1926-27 B. Sankey, Johannesburg	R. G. Tresise
1927-29 J. M. Lambe, East London	P. Adkins
1929-31 R. Macauley, Bloemfontein	E. Poole
1931-33 L. L. Horrel, Pretoria	E. Poole
1933-34 L. F. Bickell, Port Elizabeth	F. A. P. Perrow
1934-35 A. R. Metelerkamp, Bulawayo	E. Poole
1935-36 G. G. Ewer, Pietermaritzburg	E. Poole
1936-37 A. Rodwell, Johannesburg	E. Poole
1937-38 J. H. Gyles, Durban	E. Poole
1938-39 H. A. Eastman, Cape Town	E. Poole
1939-44 I. J. Nicholas, Umtata	E. Poole until Dec., 1940
1944-45 A. Rodwell, Johannesburg	L. L. Horrell, Jan., 1941
1945-46 J. S. Clinton, Salisbury	L. L. Horrell
J. W. Phillips, Bulawayo	L. L. Horrell to Nov., 1945
1946-47 G. J. Muller, Bloemfontein	A. T. Taylor, Dec., 1945
1947-48 C. Kinsman, Durban	A. T. Taylor
1948-49 A. Foden, East London	A. T. Taylor
1949-50 D. A. Bradley, Port Elizabeth	A. T. Taylor
1950-51 C. R. Hallé, Pietermaritzburg	A. T. Taylor
1951-52 J. C. Downey, Springs	A. T. Taylor
1952-53 A. R. Sibson, Bulawayo	A. T. Taylor
1953-54 J. C. Fraser, Johannesburg	A. T. Taylor
1954-55 G. J. Muller, Bloemfontein	A. T. Taylor
1955-56 D. J. Hugo, Pretoria	A. T. Taylor to 30th June, 1955 Arthur Tingey, Ewing & Co., 1st July, 1955.

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.

<i>Councillor :</i>	<i>Alternate Councillors :</i>	<i>Engineers :</i>
	1935-36 :	G. H. Swingler, Cape Town
T. P. Gray, Johannesburg	H. W. Dely, Pretoria	J. H. Gyles, Durban
J. McLean, Port Elizabeth		T. Millar, Harrismith
	1936-37 :	E. A. Behrens, Port Elizabeth
H. Middlebrook, Durban	F. Morrell, Cape Town	G. H. Swingler, Cape Town
T. P. Gray, Johannesburg	J. McLean, Port Elizabeth	T. Jagger, Ladysmith
	1937-38 :	E. A. Behrens, Port Elizabeth
H. C. Capell, Durban	H. Middlebrook, Durban	G. M. Pirie, Bloemfontein
W. James, Cape Town	L. Hofmeyr, Stellenbosch	L. L. Horrell, Pretoria
		J. S. Clinton, Salisbury
		A. Q. Harvey, Springs
		G. M. Pirie, Bloemfontein

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

E. Spilkin, Umtata W. James, Cape Town	1938-39 : C. C. Starkey, East London W. Fowkes, Cape Town	D. J. Hugo, Pretoria J. S. Clinton, Salisbury A. O. Harvey, Springs G. M. Pirie, Bloemfontein D. J. Hugo, Pretoria C. Kinsman, Durban
E. Spilkin, Umtata C. Olley, Salisbury	1939-44 : C. C. Starkey, East London W. Fowkes, Cape Town	A. O. Harvey, Springs G. M. Pirie, Bloemfontein W. N. Powell, Bloemfontein D. J. Hugo, Pretoria C. Kinsman, Durban J. C. Fraser, Johannesburg G. R. E. Wright, Benoni D. J. Hugo, Pretoria C. Kinsman, Durban
H. H. Verity, Johannesburg C. Olley, Salisbury	1944-45 : H. E. Gearing, Cape Town R. M. Thomas, Durban	J. C. Fraser, Johannesburg G. R. E. Wright, Benoni D. J. Hugo, Pretoria I. C. Fraser, Johannesburg I. C. Downey, Springs D. A. Bradley, Port Elizabeth D. J. Hugo, Pretoria
I. Ohlsen, Bulawayo J. W. du Plessis, Bloemfontein	1945-46 : M. Jaffray, Salisbury E. Boylan, M.P.C., Johannesburg	D. J. Hugo, Pretoria I. C. Fraser, Johannesburg I. C. Downey, Springs D. A. Bradley, Port Elizabeth D. J. Hugo, Pretoria I. C. Fraser, Johannesburg I. C. Downey, Springs H. A. Eastman, Cape Town D. J. Hugo, Pretoria
P. J. C. du Plessis, M.P.C., (Bloemfontein) Major J. Raftery, J.P., M.P.C., (Durban)	1946-47 : A. Immink, Johannesburg A. Z. Berman, Cape Town	I. C. Fraser, Johannesburg I. C. Downey, Springs H. A. Eastman, Cape Town D. J. Hugo, Pretoria I. C. Fraser, Johannesburg I. C. Downey, Springs H. A. Eastman, Cape Town I. C. Fraser, Johannesburg I. C. Downey, Springs H. A. Eastman, Cape Town G. I. Muller, Bloemfontein A. R. Sibson, Bulawayo J. L. van der Walt, Krugersdorp
Major J. Raftery, J.P., M.P.C. (Durban) E. H. Tiddy, East London	1947-48 : I. M. Preller, Pretoria C. G. Thompson, Johannesburg	
E. H. Tiddy, East London J. C. K. Erasmus, J.P., Port Elizabeth	1948-49 : C. G. Thompson, Johannesburg J. Johnston, Durban	
J. C. K. Erasmus, J.P., Port Elizabeth C. E. (Sax) Young, Pietermaritzburg	1949-50 : W. F. du Plessis, Bloemfontein S. H. Millar, Bulawayo	

NOTE.—At the Twenty-Fourth Convention the Rules and Constitution were amended to permit of eight Councillor 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:—

<i>Councils : 1950-51 :</i>				<i>Engineers :</i>			
Pietermaritzburg	---	---	Councillor C. E. Young	---	---	C. R. Hallé	
Springs	---	---	Councillor L. P. Davies	---	---	J. C. Downey	
Bulawayo	---	---	Councillor I. J. Wrathall	---	---	A. R. Sibson	
Bloemfontein	---	---	Councillor W. F. du Plessis	---	---	G. J. Muller	
Cape Town	---	---	Councillor I. Muller	---	---	H. A. Eastman	
Durban	---	---	Councillor G. Hayward	---	---	C. Kinsman	
Krugersdorp	---	---	Councillor E. B. Neill	---	---	I. L. van der Walt	
Johannesburg	---	---	Councillor L. M. Weiner	---	---	I. C. Fraser	
						D. A. Bradley	
						A. Foden	

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

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

Councils : 1952-53 :

Engineers :

Bulawayo	---	---	---	---	Councillor T. W. Gubb	---	---	A. R. Sibson
Bloemfontein	---	---	---	---	Councillor E. B. Altona	---	---	G. J. Muller
Cape Town	---	---	---	---	Councillor A. E. Keen	---	---	C. G. Downie
Durban	---	---	---	---	Councillor H. L. Richardson	---	---	C. Kinsman
Johannesburg	---	---	---	---	Councillor H. W. Harrison	---	---	J. C. Fraser
Krugersdorp	---	---	---	---	Councillor M. C. Dames	---	---	J. L. van der Walt
Port Elizabeth	---	---	---	---	Councillor L. Dubb	---	---	D. A. Bradley
Salisbury	---	---	---	---	Alderman Morton Jaffray	---	---	J. E. Mitchell
								C. R. Hallé
								J. C. Downey

Councils : 1953-54 :

Engineers :

Johannesburg	---	---	---	---	Councillor H. W. Harrison	---	---	J. C. Fraser
Bloemfontein	---	---	---	---	Councillor G. A. Fichardt	---	---	G. J. Muller
Port Elizabeth	---	---	---	---	Councillor A. Marknam	---	---	D. A. Bradley
Cape Town	---	---	---	---	Councillor A. F. Keen	---	---	C. G. Downie
Durban	---	---	---	---	Councillor H. L. Richardson	---	---	C. Kinsman
Salisbury	---	---	---	---	Alderman A. Morton Jaffray	---	---	J. E. Mitchell
Krugersdorp	---	---	---	---	Councillor M. C. Dames	---	---	J. L. van der Walt
Pretoria	---	---	---	---	Councillor C. E. Acton	---	---	D. J. Hugo
								J. C. Downey
								A. R. Sibson

Councils : 1954-55 :

Engineers :

Bloemfontein	---	---	---	---	Councillor F. J. C. Castelyn	---	---	G. J. Muller
Cape Town	---	---	---	---	Councillor P. D. Santilhano	---	---	C. G. Downie
Krugersdorp	---	---	---	---	Councillor M. C. Dames	---	---	J. L. van der Walt
Port Elizabeth	---	---	---	---	Councillor A. Marknam	---	---	D. A. Bradley
Pretoria	---	---	---	---	Councillor C. E. Acton	---	---	D. J. Hugo
Pietermaritzburg	---	---	---	---	Councillor C. E. K. Young	---	---	C. R. Hallé
Salisbury	---	---	---	---	Alderman A. Morton Jaffray	---	---	J. E. Mitchell
Springs	---	---	---	---	Councillor L. P. Davies	---	---	J. C. Downie
								A. R. Sibson
								J. C. Fraser

Councils : 1955-56 :

Engineers :

Pretoria	---	---	---	---	Councillor P. G. E. Blynaut	---	---	D. J. Hugo
Salisbury	---	---	---	---	Alderman A. Morton Jaffray	---	---	J. E. Mitchell
Johannesburg	---	---	---	---	Councillor D. J. Marais	---	---	R. W. Kane
Cape Town	---	---	---	---	Councillor P. D. Santilhano	---	---	C. G. Downie
Pietermaritzburg	---	---	---	---	Councillor C. E. K. Young	---	---	C. R. Hallé
Germiston	---	---	---	---	Councillor H. Boneschans	---	---	C. Lombard
Krugersdorp	---	---	---	---	Councillor P. J. Jonker	---	---	J. L. van der Walt
Springs	---	---	---	---	Councillor L. P. Davies	---	---	J. C. Downey
Bloemfontein (Co-opted)	---	---	---	---	Councillor F. J. C. Castelyn	---	---	G. J. Muller
								A. R. Sibson

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.
- (f) Regional Branches.

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.

(f) Regional Branches :

- (1) On application in writing being received from the Councillor and Engineer members of not less than five Municipal Electricity Undertakings, the Executive Council may approve of the setting up of a Regional Branch of the Association, and such Regional Branch may continue to operate under By-Laws laid down from time to time by the Executive Council, until such time as the Executive Council may decide that such Regional Branch should cease to exist.
- (2) The Executive Council shall from time to time delineate the geographical area falling under the jurisdiction of a Regional Branch.

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.
- (f) As laid down in 4(f) Qualifications.

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	$\frac{1}{2}$ million kWh. sold	---	---	6 guineas
Over	$\frac{1}{2}$ to 1	"	"	8 "
Over	1 to 5	"	"	10 "
Over	5 to 25	"	"	12 "
Over	25 to 125	"	"	14 "
Over	125 to 500	"	"	16 "
Over	500 to 1000	"	"	20 "
Over	1000 million kWh. sold	---	---	25 "
				30 "

- (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, the Chairman of any properly constituted regional branches, six other Engineer Members and eight Councillor Members.

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

Election of Council. The officers (other than the Secretary/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/Treasurer. The Council shall appoint and from time to time determine the remuneration (if any) and prescribe the duties of the Secretary/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.

Conventions. 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/Treasurer shall present the Report and Balance Sheet of the Association for the immediate past period.

Representation by Companies. Subject to the payment of the fees prescribed herein, Companies approved by the Executive Council, may be represented at Conventions of the Association. The representatives of any one Company, at any Convention, shall not exceed two in number, except with the consent of the Executive Council.

The fees payable by Companies and their representatives shall be:—

Company Convention Fees: £10 10s. 0d. per Company.

Representatives : £3 0s. 0d. per representative plus £1 0s 0d. per accompanying lady.

The President may accord the courtesy of debate to any visitor or Company representative.

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.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

MEMBERS, DELEGATES AND VISITORS ATTENDING THE 30th CONVENTION

OFFICIAL DELEGATES :

- ALBERTON :
Cr. P. J. Fick.
M. W. Odendaal.
- ALIWAL NORTH :
J. W. Ross.
- BENONI :
Cr. G. Wadmsley.
D. Lees.
- BETHAL :
M. N. Kirberger.
- BETHLEHEM :
Cr. B. Smuts.
K. M. Fisher.
- BLOEMFONTEIN :
Cr. C. F. Castelyn.
G. J. Muller.
- BOKSBURG :
Cr. V. D. Terblans.
E. L. Smith.
- BOTHAVILLE :
Cr. P. G. Fourie.
J. D. Hattingh.
- BRAKPAN :
Cr. N. J. Weinberg.
P. L. Vergottini.
- BULAWAYO :
Cr. S. H. Millar.
Cr. J. W. Phillips.
A. R. Silson.
- CAPE TOWN :
C. G. Downie.
- CRADOCK :
A. Rossler.
- DE AAR :
J. A. Macques.
- DURBAN :
Cr. M. Spanier-Marson.
R. M. O. Simpson.
- EAST LONDON :
Cr. R. L. de Lange.
P. A. Giles.
- EDENVALE :
Cr. J. P. Pienaar.
R. V. Bailey.
- ESTCOURT :
J. G. F. Erikson.
- GATOOMA :
P. C. Grandin.
- GERMISTON :
Cr. H. Boneschans.
C. Lombard.
- GRAAFF-REINET :
G. Schaftenaar.
- GRAHAMSTOWN :
I. Iverach.
- HEIDELBERG :
Cr. Rautenbach.
Cr. Robertson.
- JOHANNESBURG :
Cr. D. J. Marais.
R. W. Kane.
- KEMPTON PARK :
Cr. B. F. J. Jacobs.
L. Futecher.
- KIMBERLEY :
Cr. D. W. Fullard.
J. A. Mathews.
- KLERKSDORP :
Cr. Van Onselen :
J. M. Gericke.
- KROONSTAD :
W. Rossler.
- KRUGERSDORP :
Cr. J. P. Jonker.
J. L. van der Walt.
- LADYSMITH :
Cr. E. C. Tozer.
F. Stevens.
- LIVINGSTONE :
G. Anderson.
- LOUIS TRICHARDT :
Cr. C. H. Roux.
G. A. Lotter.
- MAFEKING :
Cr. B. C. Fox.
G. E. H. Jones.
- NELSPRUIT :
W. A. Martinson.
- N'DOLA :
J. McGibbon.
- PAARL :
Cr. E. de Preez.
H. J. Relihan.
- PARYS :
D. R. Pretorius.
- PIETERSBURG :
J. I. Inglis.
- PIETERMARTZBURG :
Cr. C. E. K. Young.
C. R. Hallé.
- PIET RETIEF :
T. M. Moecke.
- PORT ELIZABETH :
Cr. A. Markman.
D. Murray-Nobbs.
- POTCHEFSTROOM :
F. J. W. Barnard.
- POTGIETERSRUST :
P. J. Vorster.
- PRETORIA :
Cr. P. C. G. Blignaut.
D. J. Hugo.
J. Wilson.
- QUE QUE :
Cr. W. E. Ogley.
J. Yodaiken.
- RANDFONTEIN :
Cr. J. P. le Roux.
I. R. Cherry.
- RODEPOORT-MARAISBURG :
Cr. H. I. Hugo.
D. D. Brown.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

RUSTENBURG :
Cr. D. G. Kruger.
P. A. Meintjes.

SALISBURY :
Cr. H. Pichanick (Mayor)
Alderman Morton Jafray.
J. E. Mitchell.
E. C. Lynch.

SPRINGS :
Cr. L. P. Davies.
Cr. E. R. Snyman.
J. C. Downey.

STANDERTON :
Cr. L. van der Merwe.
G. B. Heunis.

UITENHAGE :
Cr. T. Fowlds.
J. D. Dawson.

UMTALI :
H. T. Turner.

VRYHEID :
Cr. R. G. Large.
W. Rush.

WELKOM :
Cr. J. H. Coppens.
R. W. Barton.

WESTONARIA :
Cr. W. P. de Villiers.
L. Drever.

WINDHOEK :
G. S. Fainsinger.

WITBANK :
E. E. de Villiers.

WORCESTER :
Cr. P. Rabie.
W. Theron.

OTHER MEMBERS :

C. R. Burton (Associate Member)
A. R. Campbell (Associate Member)
D. J. R. Conradie (Associate Member)
G. A. Dalton (Associate Member)
J. C. Fraser (Hon. Member)
H. Jasper Gripper (Associate Member)

I. L. Hobbs (Engineer Member)
W. H. Milton (Hon. Member)
Major S. G. Redman (Hon. Member)
B. H. Tubb (Associate Member)
J. T. Williams (Associate Member)
V. E. Williams (Associate Member)

A.M.E.U. OFFICIALS :

R. G. Ewing (representing the Secretaries)
A. P. Burger (Hon. Legal Adviser)

DELEGATES :

GOVERNMENT DEPARTMENTS AND PUBLIC UTILITIES

A. B. Cowen, Chairman, Electricity Supply Commission of S. Rhodesia.
Dr. F. J. de Villiers, Chairman, Electricity Control Board.
Prof. J. Goudriaan, Electricity Control Board.
M. Hewitson, Chief Engineer, G.P.O. Pretoria.
A. Jackson, Cape Provincial Administration.
A. W. Lineker, Rand Water Board.
T. McKenzie, A. Middlecote, F. J. Prins, J. Ritchie, South African Bureau of Standards.
G. C. Molyneux, Rhodesian Railways.
W. H. Milton, Electricity Supply Commission of South Africa.
R. N. F. Smit, Chief Inspector of Factories, Pretoria.

OTHER REPRESENTATIVES :

Dr. W. Adams, Rhodesia University.
W. C. J. Isaac, South African Institute of Certificated Engineers.
R. H. Roberts, Rhodesian Institute of Engineers.
R. W. Kane, South African Institute of Electrical Engineers and South African Institution of Mechanical Engineers.
J. C. Fraser, The Institution of Certificated Engineers, S.A. (Safety Precautions Committee) and the South African Electrical Review.

VISITORS :

Sir Malcolm Barrow, Minister of Power, Salisbury.
J. D. C. Baxter, Northern Cape Regional Electrification Board.
T. Bishop, Merz & McLellan, Johannesburg.
Cr. L. J. Boshoff, Salisbury.
B. G. F. Browne, representing U.K. Trade Commissioner.
H. J. Bullard, Salisbury.
J. D. Burnell, Brian Colquhoun & Partners, Salisbury.
Cr. Mrs. F. Chisholm, Salisbury.
Cr. Mrs. H. J. Denton, Salisbury.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

Cr. D. Divaris, Salisbury.
 T. K. Douglas, Merz & McLellan, Salisbury.
 Alderman L. B. Fereday, Salisbury.
 H. Foden, Salisbury.
 Cr. Mrs. A. Greves, Salisbury.
 Cr. Mrs. L. Hamilton, Salisbury.
 G. Hampson, Merz & McLellan, Salisbury.
 C. L. Hatty, Salisbury.
 R. James, Parks Superintendent, Salisbury.
 W. J. Jarvis, City Engineer, Salisbury.
 H. A. Krickler, Salisbury Chamber of Commerce.
 A. Landau, Federated Chambers of Commerce.
 C. E. R. Langford, Merz & McLellan, Johannesburg.
 H. Legge, Kanthack & Partners, Johannesburg.
 F. J. Lovatt, Town Clerk, Salisbury.
 Major E. J. Lennox, B.S.A. Police.
 H. R. Martin, City Treasurer, Salisbury.
 Alderman C. Olley, Salisbury.
 D. Piesold, H. E. Kanthack & Partners, Salisbury.
 F. A. P. Perrow, Engineering Representative, Salisbury.
 Cr. L. A. G. Pocket, Salisbury.
 Alderman R. L. Phillips, Salisbury.
 W. Robertson, Salisbury.
 O. M. Robson, Ferranti, U.K.
 N. Standing, Chief Clerk, Salisbury.
 S. W. Sandford, Salisbury.
 D. Sandison, City Valuator, Salisbury.
 M. Sarstedt, Salisbury.
 Cr. W. R. Siebert, Salisbury.
 Capt. J. Spink, B.S.A. Police.
 J. E. Stone, Salisbury.
 A. R. Stumbles, Salisbury.
 Cr. Mrs. R. O. Taylor, Salisbury.
 A. T. Thompson, Salisbury.
 Sir Roy Welensky, Deputy Prime Minister of the Federation.
 C. C. Wells, Salisbury.
 J. West, Federal Ministry of Power.
 Dr. A. J. W. Wilkins, Salisbury.

REPRESENTATIVES OF ENGINEERING COMPANIES

Aberdare Cables Africa Ltd.	---	---	---	---	R. J. Bates, G. McL., Yuill, H. A. S. Dunk.
Abedare Construction Co. (Pty.) Ltd.	---	---	---	---	T. D. Pratt.
African Cables, Ltd.	---	---	---	---	J. Berry, G. Yates.
Allenwest Rhodesia (Pvt.) Ltd.	---	---	---	---	W. L. Horrell.
Arthur Trevor Williams (Pty.) Ltd.	---	---	---	---	A. T. Williams, J. A. Barnett.
Aycliffe Cables, Ltd.	---	---	---	---	R. E. Wilson, J. W. Gaarkeuken.
Babeock & Wilcox of Africa (Pty.) Ltd.	---	---	---	---	J. S. Woosley, J. C. Callie, H. J. Kroon.
British & Dominion Merchandise	---	---	---	---	R. A. Latter.
British General Electric Co., Ltd.	---	---	---	---	W. J. Hill, J. G. Robinson.
British General Electric Co. of Central Africa (Pvt.) Ltd.	---	---	---	---	K. D. Starr.
British Insulated Callender's Cables, Ltd.	---	---	---	---	J. Russell, L. L. Langton.
British Insulated Cables (S.A.) Ltd.	---	---	---	---	A. L. Sanders, A. W. Allan.
British Thomson-Houston Co. (S.A.) (Pty.) Ltd.	---	---	---	---	L. G. Axe, H. G. Val Davies.
British Thomson-Houston Co. Central Africa (Pvt.) Ltd.	---	---	---	---	K. C. Ford, A. G. Donaldson.
Brush Aboe (Southern Africa) Ltd.	---	---	---	---	I. White.
Caltex (Africa) Ltd.	---	---	---	---	Dr. R. W. Clair.
Chloride Electrical Storage Co. (S.A.) (Pty.) Ltd.	---	---	---	---	A. C. Tilley.
J. Clack & Co. (Pvt.) Ltd.	---	---	---	---	C. W. Lander.
Contactar (Pty.) Ltd.	---	---	---	---	D. M. Castle.
Cooper & de Beer (Pty.) Ltd.	---	---	---	---	C. L. de Beer.
Davidson & Co. (Africa) (Pty.) Ltd.	---	---	---	---	H. Doughty, F. S. Haigh.
K. B. Davies & Co. (Pvt.) Ltd.	---	---	---	---	K. B. Davies.
Dowson & Dobson, Ltd.	---	---	---	---	W. D. Hutty.
Enfield Cables (S.A.) (Pty.) Ltd.	---	---	---	---	A. E. Torrance, P. P. Miles.
English Electric Co. of S.A. (Pty.) Ltd.	---	---	---	---	L. L. Brinkworth, A. E. O'Dowd.
First Electric Corporation of S.A. Ltd.	---	---	---	---	B. D. Bales.
General Motors (South Africa) Ltd.	---	---	---	---	T. R. Park.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

W. T. Glover & Co., Ltd.	W. J. G. Emery.
Henley's S.A. Telegraph Works Co., Ltd.	R. W. Lord.
Hopkinsons (S.A.) (Pty.) Ltd.	E. C. Enfield, W. G. van Aswegen.
Hubert Davies & Co., Ltd.	W. N. Powell, G. H. Chaloner.
International Combustion Africa Ltd.	H. Seabrooke.
John Brown Land Boilers (Africa) (Pty.) Ltd.	G. Richardson, W. H. Wilson.
Johnson & Phillips S.A. (Pty.) Ltd.	E. W. Dixon.
George Kent (S.A.) (Pty.) Ltd.	J. Scanes, G. H. Toop.
Harold Marthinussen & Co. (Pty.) Ltd.	G. Roeske.
Metropolitan-Vickers Central Africa (Pvt.) Ltd.	C. R. Deglon, A. T. Greswell.
Metropolitan-Vickers South Africa (Pty.) Ltd.	S. McCracken, J. Monks.
Mine-Elect (Pvt.) Ltd.	B. V. Hawgood, G. ff. Bellairs.
C. A. Parsons & Co. (S.A.) (Pty.) Ltd.	H. M. Rochester.
Reunert & Lenz, Ltd.	C. J. Hopewell.
A. Reyrolle & Co., (Rhodesia) Ltd.	J. F. Bird, A. S. Bridger.
Rice & Diethelm Limited	N. Raban, H. L. Ramsden.
Scottish Cables (S.A.) Ltd.	K. N. Weeden, A. C. Grant, D. G. Sutherland.
Selly Engineers (Pty.) Ltd.	K. M. Johnson.
Shell Company of South Africa, Ltd.	G. Phillips, P. A. V. Dolleymore.
Siemens Brothers (British) (Pty.) Ltd.	L. E. Sessel.
Simplex Electric Company (S.A.) (Pty.) Ltd.	R. A. Dines.
Southern African Cable Makers' Association	A. L. Sanders.
South African General Electric Co. (Pty.) Ltd.	R. Kilfoil, E. Crole.
Standard Telephones & Cables, Ltd.	F. C. Deakin, R. L. Stewart.
Stamcor (Pty.) Ltd.	J. M. Taylor.
Stewarts & Lloyds of Rhodesia Limited	P. M. Jackson.
Stewarts & Lloyds of S.A. Limited	T. A. Robinson.
Stratford Engineering (Pty.) Ltd.	E. I. Stratford.
Yarrow (Africa) (Pty.) Ltd.	H. D. Harris.

LADIES

Adams, Mrs. W., Salisbury.	Foreday, Mrs. L. B., Salisbury.
Anderson, Mrs. G., Livingstone.	Fick, Mrs. P. J., Alberton.
Axe, Mrs. L. G., Johannesburg.	Fisher, Mrs. K. N., Bethlehem.
Bailey, Mrs. R. V., Edenvalle.	Ford, Mrs. K. C., Salisbury.
Bales, Mrs. B. D., Knights.	Fowlds, Mrs. T., Uitenhage.
Barnett, Mrs. J. A., Johannesburg.	Fox, Mrs. B. C., Mafeking.
Bates, Mrs. R. J., Port Elizabeth.	Fraser, Mrs. J. C., Johannesburg.
Baxter, Mrs. J. D. C., Kimberley.	Fraser, Miss, Johannesburg.
Bird, Mrs. J. F., Salisbury.	Futcher, Mrs. L., Kempton Park.
Bishop, Mrs. T., Johannesburg.	Grandin, Mrs. P. C., Gatooma.
Bridger, Mrs. A. S., Johannesburg.	Grant, Mrs. A. C., Johannesburg.
Boshoff, Mrs. L. J., Salisbury.	Greaves, Mrs. A., Salisbury.
Burton, Mrs. C. R., Kimberley.	Greswell, Mrs. A. T., Salisbury.
Brownie, Mrs. B. G. F., Salisbury.	Harris, Mrs. H. D., Johannesburg.
Burnell, Mrs. J. D., Salisbury.	Hawgood, Mrs. B. V., Salisbury.
Campbell, Mrs. A. R., Johannesburg.	Hugo, Mrs. D. J., Pretoria.
Cherry, Mrs. J. R., Randfontein.	Heunis, Mrs. G. B., Standerton.
Clair, Mrs. R. W., Salisbury.	Inglis, Mrs. J. I., Pietersburg.
Conradie, Mrs. D. J. R., Bloemfontein.	Jaffray, Mrs. M., Salisbury.
Davis, Miss, Durban.	Jarvis, Mrs. W. J., Salisbury.
Dawson, Mrs. J. D., Uitenhage.	Jones, Mrs. G. E. H., Mafeking.
Davies, Mrs. K. B., Salisbury.	Jonker, Mrs. J. P., Krugersdorp.
Deakin, Mrs. F. C., Johannesburg.	Johnston, Mrs. K. M., Salisbury.
De Beer, Mrs. C. L., Johannesburg.	Krickler, Mrs. H. A., Salisbury.
Deglon, Mrs. C. R., Salisbury.	Kroon, Mrs. H. J., Salisbury.
De Villiers, Mrs. E. E., Witbank.	Landau, Mrs. A., Salisbury.
De Villiers, Mrs. W. P., Westonaria.	Langton, Mrs. L. L., Salisbury.
Dines, Mrs. R. A., Springs.	Large, Mrs. R. G., Vryheid.
Divaris, Mrs. D., Salisbury.	Latter, Mrs. R. A., Salisbury.
Dixon, Mrs. E. W., Germiston.	Lees, Mrs. D., Benoni.
Dolleymore, Mrs. P., Salisbury.	Lennox, Mrs. E. J., Salisbury.
Douglas, Mrs. T. K. A., Salisbury.	Le Roux, Mrs. J. P., Randfontein.
Downey, Mrs. J. C., Springs.	Lombard, Mrs. C., Germiston.
Doughty, Mrs. H., Springs.	Lord, Mrs. R. W., Johannesburg.
Dreyer, Mrs. L., Westonaria.	Lotter, Mrs. G., Louis Trichardt.
Emery, Mrs. W. J. G., Salisbury.	Lowatt, Mrs. F. J., Salisbury.
Enfield, Mrs. E. C., Johannesburg.	McCracken, Mrs. S., Johannesburg.
Ewing, Mrs. R. G., Johannesburg.	Marais, Mrs. D. J., Johannesburg.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

Markman, Mrs. A., Port Elizabeth.
 Martin, Mrs. H. R., Salisbury.
 Mathews, Mrs. J. A., Kimberley.
 Miles, Mrs. P. P., Johannesburg.
 Milton, Mrs. W. H., Johannesburg.
 Mitchell, Mrs. J. E., Salisbury.
 Mocke, Mrs. T. M., Piet Retief.
 Molyneux, Mrs. G. C., Bulawayo.
 Muller, Mrs. G. J., Bloemfontein.
 Ogley, Mrs. W. E., Que Que.
 Olley, Mrs. C., Salisbury.
 O'Keeney, Miss A., Kimberley.
 Pichanick, Mrs. H., Salisbury.
 Pienaar, Mrs. J. P., Edenvale.
 Piesold, Mrs. D., Salisbury.
 Pocket, Mrs. L., Salisbury.
 Perrow, Mrs. F. A., Salisbury.
 Pretorius, Mrs. D. R., Parys.
 Raban, Mrs. N., Salisbury.
 Ramsden, Mrs. H. L., Salisbury.
 Richardson, Mrs. G., Johannesburg.
 Roberts, Mrs. R. H., Salisbury.
 Robinson, Mrs. J. G., Salisbury.
 Robinson, Mrs. T. A., Johannesburg.
 Robson, Mrs. O. M., England.
 Rochester, Mrs. H. M., Bulawayo.
 Rush, Mrs. W., Vryheid.
 Rossler, Mrs. A., Cradock.
 Roux, Mrs. C. H., Louis Trichardt.
 Russell, Mrs. J., Salisbury.
 Sandison, Mrs. D., Salisbury.
 Sarstedt, Mrs. M., Salisbury.
 Scanes, Mrs. J., Salisbury.
 Seabrooke, Mrs. H., Salisbury.
 Sessel, Mrs. L. E., Salisbury.
 Sibson, Miss S. D., Bulawayo.

Siebert, Mrs. W. R., Salisbury.
 Simpson, Mrs. R. M. O., Durban.
 Smith, Mrs. E. L., Boksburg.
 Spink, Mrs. J., Salisbury.
 Starr, Mrs. K. D., Salisbury.
 Stevens, Mrs. F., Ladysmith.
 Stewart, Mrs. R. L., Salisbury.
 Stone, Mrs. J. E., Salisbury.
 Stumbles, Mrs. A. R., Salisbury.
 Sutherland, Mrs. D. G., Johannesburg.
 Smit, Mrs. R. N. F., Pretoria.
 Simpson, Miss D., Durban.
 Simpson, Miss C., Durban.
 Spanier-Marson, Mrs. M., Durban.
 Smith, Mrs. W., Salisbury.
 Thompson, Mrs. A. T., Salisbury.
 Toop, Mrs. G. H., Johannesburg.
 Tozer, Mrs. E. C., Ladysmith.
 Turner, Mrs. H. T., Umhali.
 Val Davies, Mrs. H. G., Johannesburg.
 Van der Walt, Mrs. J. L., Krugersdorp.
 Vergottini, Mrs. P. L., Brakpan.
 Vorster, Mrs. P. J., Potgietersrust.
 Walmley, Mrs. G., Benoni.
 Weeden, Mrs. K. N., Salisbury.
 Weinberg, Mrs. N. J., Brakpan.
 Wells, Mrs. C. C., Salisbury.
 West, Mrs. J., Salisbury.
 Welensky, Lady, Salisbury.
 Wilkins, Mrs. A. J., Salisbury.
 Williams, Mrs. A. T., Johannesburg.
 Williams, Mrs. J. T., Pretoria.
 Wilson, Mrs. J., Pretoria.
 Wilson, Mrs. W. H., Johannesburg.
 Woosley, Mrs. J., Vereeniging.
 Yodaiken, Mrs. J., Que Que.

LIST OF MEMBERS AS AT 31st MAY, 1956

HONORARY MEMBERS

Bellad-Ellis, W., 2, Somerset Road, East London.
 Eastman, H. A., Torwood, Parel Vallei, Somerset West, C.P.
 Fraser, J. C., 26, Grace Road, Mountain View, Johannesburg.
 Kinsman, C., 7, Highgate Place, Durban North.
 Milton, W. H., c/o. Electricity Supply Commission, P.O. Box 1091,
 Johannesburg.
 Jaffray, A. Morton (Alderman), 8, Fairbridge Avenue, Salisbury.
 Poole, E., 3, Musgrave Mansions, 690, Musgrave Road, Durban.
 Rodwell, A. T., "Miranda", Oxford Road, Parktown, Johannesburg.
 Redman, Major S. G., c/o. Merz & McLellan, Escom House,
 Rissik Street, Johannesburg.
 Young, C. E. K., 6, Lexdon Circle, Pietermaritzburg.

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.
 De Aar, C.P., Municipality, P.O. Box 42.
 Delmas, Tvl., Village Council, P.O. Box 6.
 Durban, Natal, City Council, P.O. Box 147.
 Dewetsdorp, O.F.S., Municipality, P.O. Box 13.
 East London, C.P., City Council, P.O. Box 134.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

- 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.
- Gatooma, S.R., Municipality, P.O. Box 114.
 Grahamstown, C.P., City Council, P.O. Box 176.
 George, C.P., Municipality, P.O. Box 28.
 Greytown, Natal, Borough, P.O. Box 71.
 Gwelo, S.R., Municipality, P.O. Box 278.
 Graff-Reinet, C.P., Municipality, P.O. Box 71.
 Gernistown, Tvl., City Council, P.O. Box 145.
- Harrismith, O.F.S., Municipality, P.O. Box 43.
 Heidelberg, Tvl., Municipality, P.O. Box 201.
- Johannesburg, Tvl., City Council, P.O. Box 1049.
- Kimberley, C.P., City Council, P.O. Box 194.
 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., Town Council, P.O. Box 94.
 Komgaba, 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'd., Municipality, P.O. Box 42.
 Matiele, E.G., Municipality, P.O. Box 35.
 Middelburg, C.P., Municipality, P.O. Box 55.
 Middelburg, Tvl., Municipality, P.O. Box 14.
 Mossel Bay, Municipality, P.O. Box 25.
- 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, P.O. Box 13.
 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.
 Postmasburg, C.P., Municipality, P.O. Box 5.
- 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-Maraaisburg, 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.
 Umata, Tembuland, Municipality, P.O. Box 57.
 Umtali, S.R., Municipality, P.O. Box 121.
 Upington, 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, P.O. Box 35.
 Vryheid, Natal, Borough, P.O. Box 57.
 Ventersdorp, Tvl., Municipality, P.O. Box 15.
- Walmer, C.P. Municipality, P.O. Box 5010,
 Walmer.
 Warmbaths, Tvl., Municipality, Warmbaths.
 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 708.
 Witbank, Tvl., Municipality, P.O. Box 3, Witbank.

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.
 Asselbergs, P. C., Town Electrical Engineer, P. O. Box 48, Ermelo, Transvaal.
- Bahr, H., Municipal Electrical and Waterworks Engineer, P.O. Box 15, Ventersdorp, Tvl.
 Bailey, R. V., Town and Electrical Engineer, P.O. Box 25, Edenvale, 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.
 Barton, B. W., Electrical Engineer, P.O. Box 708, Welkom, O.F.S.
 Bechler, P., Town Electrical Engineer, P.O. Box 43, Harrismith, O.F.S.
 Brown, D. D., Municipal Electrical Engineer, P.O. Box 217, Roodepoort, Tvl.
- Clarke, M. P. P., Municipal Electrical Engineer, P.O. Box 21, Somerset East, C.P.
 Cherry, J. R., Municipal Electrical Engineer, P. O. Box 139, Randfontein, Tvl.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

- Coetzee, F. J., Electrical Engineer, P.O. Box 21, Everton, Tvl.
 Cowley, B. W., Municipal Electrical Engineer, P.O. Box 33, Barberton, Tvl.
 Craig, J. S., Borough Electrical Engineer, P.O. Box 71, Greytown, Natal.
- Delport, G. C., Municipal Electrical Engineer, P.O. Box 6, Delmas, Tvl.
 De Villiers, E. E., Municipal Electrical Engineer, P.O. Box 3, Witbank, Tvl.
 De Villiers, S. de V., Municipal Electrical Engineer, P.O. Box 52, Robertson, C.P.
 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, L., Municipal Electrical Engineer, P.O. Box 19, Westonaria, Tvl.
- 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.
 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., City Electrical Engineer, P. O. Box 529, East London, C.P.
 Grandin, P. C., Municipal Electrical Engineer, P.O. Box 114, Gatooma, S.R.
- Hadfield, A. W. K., Town and Electrical Engineer, P.O. Box 278, Gwelo, S.R.
 Hafele, C. F., Deputy City Electrical Engineer, P.O. Box 288, Bloemfontein, O.F.S.
 Haig-Smith, Municipal Electrical Engineer, P.O. Box 53, Middelburg, C.P.
 Halliday, K. W. J., Municipal Electrical Engineer, P.O. Box 5, Port Shepstone, Natal.
 Hallé, 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.
 Harvey, A. Q., Town Electrical Engineer, Warmbaths, Tvl.
 Hattingh, J. D., Municipal Electrical Engineer, P.O. Box 12, Bothaville, O.F.S.
 Hatwich, A. H. J., Town and Electrical Engineer, P.O. Box 13, Dewetsdorp, O.F.S.
 Heese, J. F., Assistant Electrical Engineer, P.O. Box 94, Krugersdorp, Tvl.
 Heunis, G. B., Town and Electrical Engineer, P.O. Box 66, Standerton, Tvl.
 Hobbs, I. L., Town Electrical Engineer, P.O. Box 156, Virginia, O.F.S.
 Hugo, D. J., City Electrical Engineer, P.O. Box 423, Pretoria, Tvl.
- Inglis, J. L., 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., General Manager, Electricity Department, P.O. Box 699, Johannesburg.
 Kramer, T., Municipal Electrical Engineer, P.O. Box 113, Potchefstroom, Tvl.
 Kirberger, M. N., Town Engineer, P.O. Box 3, Bethal, Tvl.
 Kruger, M. J. C., Municipal Electrical Engineer, P.O. Box 13, Port Alfred, C.P.
- Lategan, J. F., Town Electrical Engineer, P.O. Box 201, Heidelberg, Tvl.
 Lees, D., Town Electrical Engineer, P.O. Box 45, Benoni, Tvl.
 Leishman, R., Deputy General Manager, Electricity Department, P.O. Box 699, Johannesburg.
 Lombard, C., City Electrical Engineer, P.O. Box 145, Germiston, Tvl.
 Lotter, G. A., Town Electrical Engineer, P.O. Box 96, Louis Trichardt, Tvl.
 Lynch, E. C., Assistant City Electrical Engineer, P.O. Box 73, Salisbury, S.R.
- Macques, J. A., Municipal Electrical Engineer, P.O. Box 42, De Aar, C.P.
 Martinson, W. A., Municipal Electrical Engineer, P.O. Box 45, Nelspruit, Tvl.
 Mathews, J. A., City Electrical Engineer, P.O. Box 194, Kimberley, C.P.
 Meintjies, P. A., Municipal Electrical Engineer, P.O. Box 16, Rustenburg, Tvl.
 McGibbon, J., Municipal Electrical Engineer, P.O. Box 197, N'Dola, N.R.
 Millen, T. J., Municipal Electrical Engineer, P.O. Box 23, Nigel, Tvl.
 Miln, D. R., Town Engineer, P.O. Box 46, Fort Jameson, N.R.
 Mitchell, J. E., City Electrical Engineer, P.O. Box 73, Salisbury, S.R.
 Moeke, T. M., Town and Electrical Engineer, P.O. Box 23, Piet Retief, Tvl.
 Muller, G. J., City Electrical Engineer, P.O. Box 258, Bloemfontein, O.F.S.
 McNeil, J. L., Borough Electrical Engineer, P.O. Box 72, Stanger, Natal.
- Newcombe, P. H., Municipal Electrical Engineer, P.O. Box 28, George, C.P.
 Nobbs, D. M., City Electrical Engineer, P.O. Box 369, Port Elizabeth.

- Odendaal, M. W., Town Electrical Engineer, P.O. Box 4, Alberton, Tvl.
- 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.
- Redman, R. H., Deputy City Electrical Engineer, P.O. Box 1803, Bulawayo.
 Relihan, H. J., Municipal Electrical Engineer, P.O. Box 12, Paarl, C.P.
 Reyneke, G. M., Town Electrical Engineer, P.O. Box 26, Winburg, O.F.S.
 Rogers, J., Municipal Electrical Engineer, P.O. Box 36, Fort Beaufort, C.P.
 Ross, J. W., Municipal Electrical Engineer, P.O. Box 206, Aliwal North, C.P.
 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 Electrical Engineer, P.O. Box 57, Vryheid, Natal.
- Sibson, A. R., City Electrical Engineer, P.O. Box 1803, Bulawayo, S.R.
 Simpson, A. C., Municipal Electrical Engineer, P.O. Box 5010, Walmer, C.P.
 Simpson, R. M. O., City Electrical Engineer, P.O. Box 147, Durban, Natal.
 Sims, C. N., Municipal Electrical Engineer, P.O. Box 3, The Strand, C.P.
 Smith, E. L., Municipal Electrical Engineer, P.O. Box 215, Boksburg, Tvl.
 Stevens, F., Borough Electrical Engineer, P.O. Box 29, Ladysmith, Natal.
 Schreuder, T. P., Municipal Electrical Engineer, P.O. Box 38, Adelaide, C.P.
 Stocks, E. R., Municipal Electrical Engineer, P.O. Box 25, Mossel Bay, C.P.
 Sulter, F. J., Assistant Electrical Engineer, P.O. Box 145, Germiston, Tvl.
- 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, Umhali, S.R.
 Turnbull, A. F., Town and Electrical Engineer, P.O. Box 35, Vereeniging, Tvl.
- Van der Merwe, F. J., Municipal Electrical Engineer, P.O. Box 64, Ladybrand, O.F.S.
 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, Oledaalsrus, 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 36, Butterworth, C.P.
 Vorster, P. J., Town Electrical Engineer, P.O. Box 34, Potgietersrust, Tvl.
- 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.
 Waldron, F. R., Municipal Electrical Engineer, P.O. Box 57, Umhata, Tembuland.
 Waddy, J. C., Assistant City Electrical Engineer, P.O. Box 399, Pietermaritzburg, Natal.

ASSOCIATES :

- Andrew, W. M., c/o. E.S.C., P.O. Box 667, East London, C.P.
 Ashley, T. P., c/. Queen's Hotel, Queenstown, C.P.
- 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., P.O. Box 4453, Johannesburg.
 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, Sasolburg, O.F.S.
 Foden, A., Manager, E.S.C. (Border Undertaking), P.O. Box 637, East London.
 Foley, C. B., c/o. Electrical Engineer, P.O. Box 35, Vereeniging, Tvl.
- Gripper, H. Jasper, P.O. Box 1403, Port Elizabeth.
 Gyles, J. H., "Bodrigge", Moyeni Road, Gilletts, Natal.
- Heasman, G. G., P.O. Box 77, Fort Victoria, S.R.
 Lutsch, W. J. F. S., c/o. Faculty of Engineering, University of Stellenbosch, C.P.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

Marchand, B., P.O. Box 223, Withank, Tvl.

Mercier, G., P.O. Box 42, Monze, N.R.

Mole, E. W., P.O. Box 3386, Johannesburg.

Muller, H. M. S., P. O. Box 112, Upington, C.P.

Nicholas, I. J., 74a, Ebden Street, Queenstown, C.P.

Powell, W. N., 104, Marlene Mansions, Abel Road, Berea, Johannesburg.

Phillips, J. W., P.O. Box 1731, Bulawayo, S.R.

Rothman, J. L., P.O. Box 606, Kimberley.

Simpson, H. G., Engineering Department, Scarles, Ltd., Great Brak River, C.P.

Theron, G. C., P.O. Box 1, Vanderbijl Park, Tvl.

Tubb, B. H. J., 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, Tvl.

Williams, V. E., c/o Merz & McLellan, 404/5, Trafalgar Court, King's Crescent, Salisbury, S.R.

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

DIE VERENIGING VAN MUNISIPALE
ELEKTRISITEITSONDERNEMINGS
VIR SUIDELIKE AFRIKA

AGENDA AND PROGRAMME

30TH ANNUAL CONVENTION

TO BE HELD IN THE

DUTHIE HALL, PARK LANE,
SALISBURY

FROM THE

7TH TO 10TH MAY, 1956.

(EXECUTIVE COUNCIL MEETINGS WILL BE HELD IN THE
ELECTRICITY OFFICES)

AGENDA EN PROGRAM

VIR DIE

30STE JAARLIKSE KONVENSIË

WAT GEHOU SAL WORD IN DIE

DUTHIESAAL, PARKLAAN,
SALISBURY

VAN AF

7 TOT 10 MEI 1956.

(VERGADERINGS VAN DIE UITVOERENDE RAAD SAL IN DIE
ELEKTRISITEITS KANTORE GEHOU WORD)

AGENDA FOR THE ANNUAL GENERAL MEETING

1. Election of President.
2. Venue of next Convention.
3. Election of Vice-President, Executive Council, Sub-Committees and Representatives.
4. Annual Report of Secretaries.
5. Retiring President's Valedictory Address.
6. Presidential Address.
7. Reports of Sub-Committees and Representatives.
 - (i) Electrical Wiremen's Registration Board.
 - (ii) South African Bureau of Standards.
 - (iii) Coal Allocation Committee.
 - (iv) Safety Precautions Committee.
 - (v) Tariffs Survey Committee.
 - (vi) Recommendations Committee for New Electrical Commodities.
 - (vii) Amendments to Constitution and Rules.
 - (viii) Papers.
 - (ix) Technical Staff and Man Power.
 - (x) Rights of Supply — Reef Industrial Consumers.
 - (xi) S.A.I.E.E. Committee—Code of Practice for Sub-Stations.
 - (xii) Conditions of Supply—Licenced Areas.
8. Appointment of Auditors.
9. Constitution and Rules.
10. General.

AGENDA VIR DIE ALGEMENE JAARVERGADERING

1. Verkieping van President.
2. Vergaderplek vir volgende Konvensie.
3. Verkieping van Onder-President, Uitvoerende Raad, Onder-Komitees en Verteenwoordigers.
4. Jaarverslag van die Sekretaris.
5. Afskeidsrede van die Aftredende President.
6. Presidentsrede.
7. Verslae van Onder-komitees en Verteenwoordigers.
 - (i) Raad vir Registrasie van Lraadwerkers.
 - (ii) Suid Afrikaanse Buro vir Standaarde.
 - (iii) Komitee vir die Toekenning van Steenkool.
 - (iv) Komitee vir Veiligheidsmaatreëls.
 - (v) Komitee van Ondersoek na Elektrisiteitstariewe.
 - (vi) Komitee vir die Aanbevelings oor Nuwe Elektriese Toerusting.
 - (vii) Wysiging van die Konstitusie en Reëls.
 - (viii) Verhandellings.
 - (ix) Tegniese Personeel en Mannekrag.
 - (x) Regte van Voorsiening—Randse Industriële Verbruikers.
 - (xi) S.A.I.E.E. Komitee—Kode van Gebruik by Sub-Stasies.
 - (xii) Voorwaarde van Voorsiening—Gelensierde Gebiede.
8. Aanstelling van Ouditoure.
9. Konstitusie en Reëls.
10. Algemeen.

RETIRING OFFICERS

President : D. J. HUGO, Pretoria.
 Vice-President : J. E. MITCHELL, Salisbury.
 Immediate Past Presidents : G. J. MULLER, Bloemfontein; A. R. SIBSON, Bulawayo.
 Engineer Members : R. W. KANE, Johannesburg; C. G. DOWNE, Cape Town; C. R. HALLE, Pietermaritzburg; C. LOMBARD, Germiston; J. L. VAN DER WALT, Krugersdorp; J. C. DOWNEY, Springs.
 Cities or Towns represented : Pretoria, Salisbury, Johannesburg, Cape Town, Pietermaritzburg, Germiston, Krugersdorp, Springs, Bloemfontein (Co-opted).

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

AFIREDENDE AMPSDRAERS

President : D. J. HUGO, Pretoria.
 Onder-president : J. E. MITCHELL, Salisbury.
 Oud-president : G. J. MULLER, Bloemfontein; A. R. SIBSON, Bulawayo.
 Ingenieurslede : R. W. KANE, Johannesburg; C. G. DOWNE, Kaapstad; C. R. HALLE, Pietermaritzburg; C. LOMBARD, Germiston; J. L. VAN DER WALT, Krugersdorp; J. C. DOWNEY, Springs.
 Stede of Dorpe Verteenwoordig : Pretoria, Salisbury, Johannesburg, Kaapstad, Pietermaritzburg, Germiston, Krugersdorp, Springs, Bloemfontein (gekoopteerde)
 L.W.—Die Stad of Dorp word verkies en nie individuele Raadslede nie.

MEMBERS OF SUB-COMMITTEES AND REPRESENTATIVES

SUB-COMMITTEES :

Papers :

D. J. HUGO, President; J. E. MITCHELL, Vice-President; A. R. SIBSON, Past President.

Tariffs Survey :

J. L. VAN DER WALT, Convenor; C. G. DOWNEY; A. R. SIBSON; J. C. DOWNEY with co-opted members.

Amendments to Constitution and Rules :

G. J. MULLER, Convenor; D. J. HUGO; A. R. SIBSON.

Finance :

R. W. KANE, J. C. DOWNEY.

Recommendations Committee for New Electrical Commodities :

J. L. VAN DER WALT, Convenor; J. C. DOWNEY.

Formation of Regional Branches :

A. R. SIBSON, Convenor; R. W. KANE; J. C. DOWNEY.

Technical Staff and Man Power :

J. L. VAN DER WALT, Convenor; J. C. DOWNEY, C. R. HALLE (with power to co-opt).

Rights of Supply — Reef Industrial Consumers :

C. LOMBARD, Convenor; D. J. HUGO, J. C. DOWNEY, J. C. FRASER.

REPRESENTATIVES :

Electrical Wiremen's Registration Board : R. W. Kane.

Coal Allocation Committee : D. J. Hugo; R. W. Kane, Alternate.

Safety Precautions Committee : J. C. Fraser; J. C. Downey, Alternate.

S.A. Bureau of Standards : J. L. van der Walt; J. C. Downey, Alternate (with power to co-opt).

S.A.I.E.E. Committee — Code of Practice for Sub-Stations : C. Lombard.

LEDE VAN ONDER-KOMITEES EN VERTEENWOORDIGERS.

ONDER-KOMITEES :

Referate :

D. J. HUGO, President; J. E. MITCHELL, Onder-president; A. R. SIBSON, Oud-president.

Komitee van Ondersoek na Elektrisiteitstariewe : J. L. VAN DER WALT, Belêër; C. G. DOWNE; A. R. SIBSON; J. C. DOWNEY met gekoopteerde lede.

Wysiging van Konstitusie en Reëls :

G. J. MULLER, Belêër; D. J. HUGO; A. R. SIBSON.

Finansiële Komitee :

R. W. KANE; J. C. DOWNEY.

*Komitee vir Aanbevelings oor Nuwe**Elektriese Toerusting :*

J. L. VAN DER WALT, Belêër; J. C. DOWNEY.

Formasie van Streekstakke :

A. R. SIBSON, Belêër; R. W. KANE, J. C. DOWNEY.

Tegniese Personeel en Mannekrag :

J. L. VAN DER WALT, Belêër; J. C. DOWNEY; C. R. HALLE (met krag om lede te koopteer).

Regte van Voorsiening—Randse Industrieële Verbruikers :

C. LOMBARD, Belêër; D. J. HUGO; J. C. DOWNEY; J. C. FRASER.

VERTEENWOORDIGERS :

Registrasieraad vir Elektriese Draadwerkers : R. W. Kane.

Komitee vir die Toekennning van Steenkool : D. J. Hugo; R. W. Kane, Alt.

Komitee vir Veiligheidsmaatreëls : J. C. Fraser; J. C. Downey, Alt.

Suid Afrikaanse Buro vir Standaarde : J. L. van der Walt; J. C. Downey, Alt. (met krag om lede te koopteer).

S.A.I.E.E. Komitee — Kode van Gebruik by Sub-Stasies : C. Lombard.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

PROGRAMME :

SATURDAY, 5th MAY, 1956 :

9.30 a.m. : Meeting of Executive Council.

SUNDAY, 6th MAY, 1956 :

8.00 p.m. : Informal gathering at Meikle's Hotel of delegates and their ladies.

MONDAY, 7th MAY, 1956 :

9.00 a.m. : Registration and issue of papers.

10.00 a.m. : Welcome by His Worship the Mayor and official opening of the Convention by Sir Malcolm Barrow, Federal Minister of Power.
Election of President.
Venue of next Convention.
Election of Vice-President.

10.30 a.m. : Refreshment interval.

11.00 a.m. : Official photograph.

11.30 a.m. : Election of Office Bearers.
Retiring President's Valedictory Address.

12.30 p.m. : Luncheon adjournment.

2.30 p.m. : Convention resumes.
Annual Report of Secretaries.
Presidential Address.

3.30 p.m. : Refreshment interval.
Reports of sub-Committees and Representatives.

4.30 p.m. : Adjourn.

6.00 p.m. : Civic sundowner (Drill Hall).

TUESDAY, 8th MAY, 1956 :

8.30 a.m. : Meeting of Executive Council.

9.30 a.m. : Convention resumes.
Communications from Council.
Appointment of Auditors.
Amendment to Constitution.
Paper by E. C. Lynch on "Electrical Development in the Salisbury Area".

10.30 a.m. : Refreshment interval.

11.00 a.m. : Discussion on Mr. Lynch's paper.

12.30 p.m. : Luncheon adjournment.

2.30 p.m. : Engineers' Forum.

3.30 p.m. : Adjourn and refreshments.

8.00 p.m. : Convention Ball (Princess Theatre).

WEDNESDAY, 9th MAY, 1956 :

8.30 a.m. : Meeting of Executive Council.

9.30 a.m. : Convention resumes.
Communications from Council.
Paper by J. Yodaiken on "Some aspects of the work and difficulties confronting the small community Electrical Engineer."

PROGRAM :

SATERDAG, 5 MEI, 1956 :

9.30 vm. : Vergadering van die Uitvoerende Raad.

SONDAG, 6 MEI, 1956 :

8.00 nm. : Informele byeenkoms van Afgevaardigdes en hul gades in die Meikle Hotel.

MAANDAG, 7 MEI, 1956 :

9.00 vm. : Registrasie en Uitreiking van Referate.

10.00 vm. : Verwelkoming deur Sy Edelgahare die Burgemeester, en amptelike opening van die Konvensie deur Sir Malcolm Barrow, Federale Minister van Krag.
Verkieping van President.
Vergaderplek vir die volgende Konvensie.
Verkieping van Onder-president.

10.30 vm. : Pouse. Verversings.

11.00 vm. : Amptelike Foto.

11.30 vm. : Verkieping van Ampsdraers.
Afsheidsrede van Aftredende President.

12.30 nm. : Verdaging vir Middagete.

2.30 nm. : Werksaamhede word hervat.
Jaarsverslag van Sekretarise Presidendsrede.

3.30 nm. : Pouse. Verversings.
Verslae van Onder-komitees en Verteenwoordigers.

4.30 nm. : Vergadering Verdaag.

6.00 nm. : Burgelike Skemperparty (Drill Hall).

DINSDAG, 8 MEI, 1956 :

8.30 vm. : Vergadering van die Uitvoerende Raad.

9.30 vm. : Konvensie-werksaamhede word hervat.
Aankondigings van die Uitvoerende Raad.
Aanstelling van Ouditeure.
Wysiging van die Konstitusie.
Referaat deur E. C. Lynch oor "Elektriese Ontwikkeling van die Salisbury Gebied."

10.30 vm. : Pouse. Verversings.

11.00 vm. : Bespreking van Mr. Lynch se Referaat.

12.30 vm. : Verdaging vir Middagete.

2.30 nm. : Ingenieursforum.

3.30 nm. : Pouse. Verversings.

8.00 nm. : Konvensie-dans (Princes Teater).

WOENSDAG, 9 MEI, 1956 :

8.30 vm. : Vergadering van die Uitvoerende Raad.

9.30 vm. : Konvensie-werksaamhede word hervat.
Aankondigings van die Uitvoerende Raad.
Referaat deur J. Yodaiken oor "Somme opsigte van die werk en moeilikhede waarteenoor die Elektriese Ingenieur in 'n klein gemeenskap te staan kom."

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

- 10.30 a.m. : Refreshment interval.
 11.00 a.m. : Discussion of papers.
 12.30 p.m. : Civic Lunch.
 2.30 p.m. : Visit to Lake Mellwaine or other visits.
 6.30 p.m. : Braai vleis (Cleveland Dam).

THURSDAY, 10th MAY, 1956 :

- 8.30 a.m. : Meeting of Executive Council.
 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. : Discussion on papers and any other business continued.
 12.30 p.m. : Convention closes.

- 10.30 vm. : Pouse. Verversings.
 11.00 vm. : Bespreking van Referate.
 12.30 nm. : Verdaging vir Burgelik middagete.
 2.30 nm. : Besoek aan McLlwaine-meer of ander besoeke.
 6.30 nm. : Braaivleis (Cleveland-dam).

DONDERDAG, 10 MEI, 1956 :

- 8.30 vm. : Vergadering van die Uitvoerende Raad.
 9.30 vm. : Konvensie — werksaamhede word hervat.
 Aankondigings van die Uitvoerende Raad.
 Bespreking van Referate en enige ander sake.
 10.30 vm. : Pouse. Verversings.
 11.00 vm. : Bespreking van Referate en enige ander sake.
 12.30 nm. : Konvensie word afgesluit.

LADIES' PROGRAMME

SUNDAY, 6th MAY, 1956 :

- 8.00 p.m. : Informal gathering at Meikle's Hotel onwards of delegates and their ladies.

MONDAY, 7th MAY, 1956 :

- 10.00 a.m. : Assemble for Official Opening of Convention.
 10.30 a.m. : Refreshments.
 11.00 a.m. : Official photograph.
 6.00 p.m. : Civic sundowner (Drill Hall).

TUESDAY, 8th MAY, 1956 :

- 10.30 a.m. : Tea with Lady Mayoress (Grand Hotel ball-room).
 8.00 p.m. : Convention Ball (Princes Theatre).

WEDNESDAY, 9th MAY, 1956 :

- 10.00 a.m. : Visit to Tobacco Auctions.
 Refreshments.
 12.30 p.m. : Civic Lunch (Drill Hall).
 2.30 p.m. : Visit to Lake Mellwaine.
 6.30 p.m. : Braaivleis (Cleveland Dam).

THURSDAY, 10th MAY, 1956 :

- 10.30 a.m. : Assemble for refreshments and closing session of Convention.

PROGRAM VIR DAMES

SONDAG, 6 MEI, 1956 :

- 8.00 nm. : Informele byeenkoms van Afgevaardigdes en hul gades in die Meikle Hotel.

MAANDAG, 7 MEI, 1956 :

- 10.00 vm. : Vergader vir die Amptelike opening van die Konvensie.
 10.30 vm. : Verversings.
 11.00 vm. : Amptelike Foto.
 6.00 nm. : Burgelike Skemerparty (Drill Hall).

DINSDAG, 8 MEI, 1956 :

- 10.30 vm. : Tee saam met die Burgemeestersvrou (Grand Hotel dans saal).
 8.00 nm. : Konvensie-dans (Princes Teater).

WOENSdag, 9 MEI, 1956 :

- 10.00 vm. : Besoek aan die Tabak-vendusies.
 Verversings.
 12.30 nm. : Verdaging vir Burgelike middagete.
 2.30 nm. : Besoek aan Mellwaine-meer.
 6.30 nm. : Braaivleis (Cleveland-dam).

DONDERDAG, 10 MEI, 1956 :

- 10.30 vm. : Vergader vir verversings en die Sluitingsessie van die Konvensie.



J. E. MITCHELL, SALISBURY.
PRESIDENT, 1956-57.



First Row (L. to R.): Mrs. B. D. Bales (Knights); B. D. Bales (Knights); J. H. West (Salisbury); Mrs. R. W. Lord (Johannesburg); F. J. C. Castelyn (Bloemfontein); G. J. Muller (Bloemfontein); J. P. Jonker (Krugersdorp); J. W. Phillips (Bulawayo); A. R. Sibson (Bulawayo); S. H. Millar (Bulawayo); C. Lombard (Germiston); D. Marais (Johannesburg); R. W. Kane (Johannesburg); F. J. de Villiers (Pretoria); P. G. C. Blignaut (Pretoria); D. J. Hugo (Pretoria); H. Pichanick, M. B. E., Mayor (Salisbury); J. E. Mitchell (Salisbury); Sir Malcolm P. Barrow (Salisbury); Morton Jaffray (Salisbury); J. L. v. d. Walt (Krugersdorp); J. C. Downey (Springs); L. P. Davies (Springs); C. E. K. Young (Pietermaritzburg); C. R. Hallé (Pietermaritzburg); C. G. Downie (Cape Town); A. P. Burger (Parow); R. G. Ewing (Johannesburg); J. Scanes (Salisbury); G. H. Toop (Johannesburg); J. C. Fraser (Johannesburg); E. C. Lynch (Salisbury); J. Monks (Johannesburg); W. Robertson (Salisbury); E. Brod (Salisbury); M. Sarstedt (Salisbury).

Second Row (L. to R.): Mrs. G. J. Muller (Bloemfontein); Mrs. J. L. v. d. Walt (Krugersdorp); Mrs. H. J. Kroon (Salisbury); Mrs. J. G. F. Erikson (Estcourt); Mrs. M. Jaffray (Salisbury); Mrs. H. T. Turner (Umtali); Mrs. R. G. Ewing (Johannesburg); Mrs. C. Lombard (Germiston); Mrs. J. P. Jonker (Krugersdorp); Mrs. S. A. Vergottini (Brakpan); Mrs. C. R. Burton (Kimberley); Miss A. O'Keeney (Kimberley); Mrs. A. C. Grant (Johannesburg); Mrs. N. J. Weinberg (Brakpan); Mrs. K. N. Weeden (Bulawayo); Mrs. A. T. Gresswell (Salisbury); Mrs. S. McCracken (Johannesburg); Mrs. C. R. Deglon (Salisbury); Mrs. H. A. Krikler (Salisbury); Mrs. G. E. H. Jones (Mafeking); Mrs. B. C. Fox (Mafeking); Mrs. D. J. Marais (Johannesburg); Mrs. J. E. Mitchell (Salisbury); Mrs. W. Milton (Johannesburg); Mrs. D. J. Hugo (Pretoria); Mrs. A. W. Bishop (Johannesburg); Mrs. K. A. Douglas (Salisbury); Miss S. D. Sibson (Bulawayo); Mrs. J. C. Downey (Springs); Mrs. R. L. R. Stewart (Salisbury); Mrs. F. C. Deacon (Johannesburg); Mrs. M. Theron (Potchefstroom); Mrs. J. C. Fraser (Johannesburg); Mrs. J. M. Heath (Bulawayo); Miss B. C. Fraser (Johannesburg); Miss J. Wilson (Pretoria); Mrs. T. D. G. Sutherland (Pietermaritzburg); Mrs. D. Lees (Benoni); Mrs. G. Walmsley (Benoni); Mrs. J. Russell (Salisbury); Mrs. A. T. Williams (Johannesburg).

Third Row (L. to R.): J. G. F. Erikson (Estcourt); P. J. Fick (Alberton); Mrs. J. M. Fick (Alberton); Mrs. J. Rochester (Johannesburg); Mrs. E. W. Dixon (Germiston); E. W. Dixon (Germiston); Mrs. A. S. Bridger (Johannesburg); Mrs. A. Rossler (Craddock); A. Rossler (Craddock); J. Iverach (Grahamstown); G. A. Dalton (Johannesburg); G. C. Molynieux (Bulawayo); H. J. Gripper (Port Elizabeth); H. T. Turner (Umtali); N. J. Weinberg (Brakpan); H. A. Krikler (Salisbury); K. M. Johnston (Salisbury); Mrs. K. M. Johnston (Salisbury); J. D. Hattimgh (Bothaville); P. A. Giles (East London); R. L. de Lange (East London); P. J. S. Fourie (Bothaville); R. W. Barton (Welkom); H. J. Coppens (Welkom); R. W. Clair (Salisbury); D. G. Kruger (Rustenburg); R. L. R. Stewart (Salisbury); F. C. Deacon (Johannesburg); Mrs. F. Stevens (Ladysmith); F. Stevens (Ladysmith); Mrs. E. C. Tozer (Ladysmith); E. C. Tozer (Ladysmith); Mrs. A. C. Burnell (Salisbury); H. Seabrooke (Salisbury); Mrs. H. D. T. Harris (Johannesburg); J. Wilson (Pretoria); Mrs. H. Seabrooke (Salisbury); H. D. T. Harris (Johannesburg).

Fourth Row (L. to R.): Mrs. K. M. Fisher (Bethlehem); K. M. Fisher (Bethlehem); Mrs. D. Conradie (Bloemfontein); D. J. R. Conradie (Bloemfontein); B. Smuts (Bethlehem); A. G. Donaldson (Salisbury); K. G. Ford (Salisbury); Mrs. L. G. Axe (Johannesburg); L. G. Axe (Johannesburg); H. G. Val Davies (Johannesburg); Mrs. H. G. Val Davies (Johannesburg); I. L. Hobbs (Virginia); F. J. W. Barnard (Potchefstroom); Mrs. E. E. de Villiers (Withank); E. E. de Villiers (Withank); E. du Preez (Paarl); P. J. Rabie (Worcester); A. T. Gresswell (Salisbury); C. R. Degdon (Salisbury); S. McCracken (Johannesburg); W. H. Milton (Johannesburg); H. Doughty (Springs); Mrs. H. Doughty (Springs); F. S. Haigh (Johannesburg); G. A. H. Schaftenaar (Graaff-Reinet); W. Rossler (Kroonstad); P. C. Grandin (Gatooma); A. E. O'Dowd (Salisbury); C. E. R. Langford (Johannesburg); J. W. Ross (Aliwal North); Mrs. R. A. Latter (Salisbury); R. Latter (Salisbury); Mrs. E. C. Enfield (Johannesburg); E. C. Enfield (Johannesburg); Mrs. D. V. Yodaiken (Que Que); J. Yodaiken (Que Que); Mrs. J. Dawson (Uitenhage); Mrs. T. Fowlds (Uitenhage); A. Jackson (Cape Town).

Fifth Row (L. to R.): J. Berry (Vereeniging); H. Hewitson (Pretoria); O. M. Robson (London); Mrs. B. Robson (London); Mrs. N. Raban (Salisbury); N. Raban (Salisbury); Mrs. R. N. F. Smit (Pretoria); R. N. F. Smit (Pretoria); Mrs. E. L. Smith (Boksburg); E. L. Smith (Boksburg); Mrs. J. T. Williams (Pretoria); J. T. Williams (Pretoria); D. M. Castle (Zuider Paarl); W. L. M. Horrell (Salisbury); W. E. Ogley (Que Que); J. Ritchie (Pretoria); Mr. Wenham (Salisbury); B. MacKenzie (Pretoria); J. A. Barnett (Johannesburg); L. Fitcher (Kempston Park); M. W. Odendaal (Alberton); G. Yates (Vereeniging); P. A. Meintjies (Rustenburg); J. Goudriaan (Pretoria); J. G. Robinson (Salisbury); B. H. Tubb (Salisbury); G. A. Lotter (Louis Trichardt); Mrs. G. A. Lotter (Louis Trichardt); C. H. Roux (Louis Trichardt); Mrs. C. H. Roux (Louis Trichardt); Mrs. W. H. Wilson (Johannesburg); W. H. Wilson (Johannesburg); W. D. Hutty (Johannesburg); T. Fowlds (Uitenhage); J. D. Dawson (Uitenhage); Mrs. J. S. le Roux (Randfontein); J. P. le Roux (Randfontein); Mrs. J. R. Cherry (Randfontein); J. R. Cherry (Randfontein); Mrs. R. A. Dines (Springs); R. A. Dines (Springs).

Sixth Row (L. to R.): H. Bouschans (Germiston); B. F. J. Jacobs (Kempston Park); G. Roeske (Johannesburg); R. W. Kilfoil (Pretoria); G. Walsley (Benoni); D. Lees (Benoni); P. L. Vergottini (Brakpan); H. J. Kroon (Salisbury); J. F. Bird (Salisbury); W. C. J. Isaac (Johannesburg); K. D. Starr (Salisbury); A. E. Torrance (Johannesburg); P. P. Miles (Salisbury); M. Spanier-Marson (Durban); Mrs. R. M. O. Simpson (Durban); R. M. O. Simpson (Durban); Miss C. L. A. Simpson (Durban); W. I. G. Emery (Salisbury); Miss D. M. Simpson (Durban); S. G. Redman (Johannesburg); J. Russell (Salisbury); A. L. Sanders (Johannesburg); A. W. Allen (Johannesburg); J. D. Burnell (Salisbury); Mrs. E. A. Campbell (Johannesburg); A. R. Campbell (Johannesburg); E. R. Snyman (Springs); Mrs. W. Rush (Vryheid); W. Rush (Vryheid); Mrs. R. G. Large (Vryheid); R. G. Large (Vryheid); L. L. Brinkworth (Johannesburg); G. Richardson (Johannesburg); Mrs. G. Richardson (Johannesburg); W. J. Hill (Johannesburg); T. M. Mocke (Piet Retief); B. C. Fox (Mafeking); G. E. H. Jones (Mafeking); C. P. Theron (Potchefstroom); R. E. Wilson (Johannesburg).

Seventh Row (L. to R.): J. White (Johannesburg); A. W. Lineker (Johannesburg); T. K. A. Douglas (Salisbury); T. R. J. Bishop (Johannesburg); T. D. Pratt (Johannesburg); H. J. Hugo (Roodepoort-Maraiburg); G. S. Fainsinger (Windhoek); R. V. Bailey (Edenvale); J. P. Pienaar (Edenvale); Mrs. H. C. Pienaar (Edenvale); F. A. P. Perrow (Salisbury); A. C. Grant (Johannesburg); K. N. Weeden (Bulawayo); H. A. S. Dunk (Port Elizabeth); F. J. Prins (Pretoria); H. J. Relihan (Paarl); C. L. de Beer (Johannesburg); C. R. Burton (Kimberley); Mrs. C. L. de Beer (Johannesburg); J. D. C. Baxter (Kimberley); W. Fullard (Kimberley); Mrs. J. A. Mathews (Kimberley); J. A. Mathews (Kimberley); Mrs. V. M. Langton (Salisbury); L. L. Langton (Salisbury); Mrs. J. Anderson (Livingstone); G. Anderson (Livingstone); L. van der Merwe (Standerton); Mrs. Heunis (Standerton); G. B. Heunis (Standerton); C. J. Hopewell (Johannesburg); W. Theron (Worcester); J. C. Callie (Johannesburg); A. Markman (Port Elizabeth); Mrs. A. Markman (Port Elizabeth); D. Murray Nobbs (Port Elizabeth); R. J. Bates (Port Elizabeth); L. Dreyer (Westonaria); W. P. de Villiers (Westonaria).

Eighth Row (L. to R.): B. V. Hawgood (Salisbury); G. ff. Bellairs (Johannesburg); H. M. Rochester (Johannesburg); J. McGibbon (N'Dola); D. D. Brown (Roodepoort-Maraiburg); A. S. Bridger (Johannesburg); J. A. Macques (De Aar); A. T. Williams (Johannesburg); R. W. Lord (Johannesburg); F. W. R. Robertson (Heidelberg); P. H. R. Bautenbach (Heidelberg); V. E. Williams (Salisbury); J. I. Inglis (Pietersburg); Mrs. J. I. Inglis (Pietersburg); B. Marchand (Withank); Mrs. J. D. C. Baxter (Kimberley); M. N. Kirberger (Bethal); A. J. Thompson (Salisbury); W. N. Powell (Johannesburg); G. H. Chaloner (Salisbury); J. M. Gericks (Klerksdorp); L. O. van Onselen (Klerksdorp); W. A. Martinson (Nelspruit); D. G. Sutherland (Pietermaritzburg); A. A. Middlecote (Pretoria); G. McL. Yuill (Johannesburg); T. A. Robinson (Johannesburg); P. M. Jackson (Salisbury); T. R. Park (Port Elizabeth); V. Terblans (Boksburg); E. J. Stratford (Johannesburg); D. R. Pretorius (Parys).

Proceedings 1st Day
Opening Session.

THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

The Thirtieth Convention of the Association was opened in the Duthie Hall, Salisbury, by Sir Malcolm Barrow, Federal Minister of Power, at 10.00 a.m. on Monday, 7th May, 1956.

Attendance at the Convention was as follows: 58 Councils represented by 41 Councillors and 59 Engineers; One other Engineer Member; Three Hon. Members (not representing Councils); Eight Associates; 13 other Representatives of Government Departments, Public Utilities and other bodies; 84 Commercial Representatives; 47 Visitors; 148 Ladies; Two A.M.E.U. Officials—a total of 406 persons.

PROCEEDINGS

THE PRESIDENT (Mr. D. J. Hugo, Pretoria): Good morning Ladies and Gentlemen, it is my very pleasant duty to welcome you all to this, our 30th Convention and also to welcome especially His Worship the Mayor of Salisbury, Councillor Pichanick. His Worship will introduce to you the Honourable Minister of Power who has kindly consented to open our proceedings today. I call upon His Worship the Mayor.

HIS WORSHIP THE MAYOR OF SALISBURY (Cr. H. Pichanick): Mr. President, Honourable Ministers, Ladies and Gentlemen, it is my privilege and pleasure to extend a very cordial welcome to delegates and their wives, Government Officials and guests who are assembled here at this mammoth Convention—the 30th—of the Municipal Electricity Undertakings of South Africa.

It is many years since this Convention was held in Salisbury—eleven years to be exact—and doubtless many of you who were here then will have noticed the remarkable changes that have taken place in this City—not the least of which is the vast expansion in our electricity undertaking, which is seven times as great as it was then.

It is a great credit to our City Electrical Engineer and his Department that very few potential consumers, within the Department's 640 square miles of territory, have had to wait very long for supply.

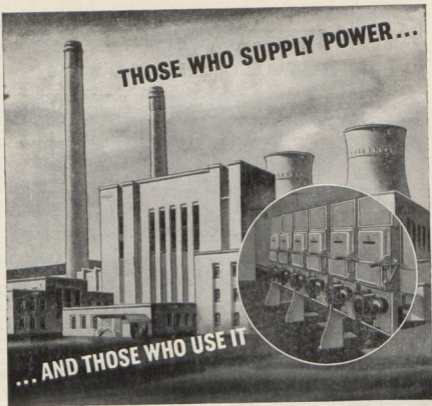
Mr. President, it is an honour to us that you have chosen Salisbury as the venue for your Convention. We are always very glad to have conferences here, firstly because we like people to see and admire our beautiful City with its imposing buildings, its fine layout, and its great activity, and secondly, because we realise the great value of important conferences such as this. Anybody with the slightest experience knows full well the opportunities which arise to exchange ideas to gain knowledge and to establish useful contacts.

I understand that when my esteemed colleague, Alderman Morton Jaffray, who is pretty well known to you, invited you here last year, he warned you that you might have to be accommodated in pole and dagga huts, and any delegates staying within 25 miles of this hall would have to walk here.

I am sure, however, that despite our temporary lack of hotel accommodation, Mr. Mitchell has arranged to accommodate you all reasonably comfortably, and if your transport is not by an electrical highway system, you will certainly not have to go about on foot.

I am told your Association continues to grow in strength, and it is a source of great help and inspiration to your members.

The work of municipal electrical engineer is beset with problems, not the least being to catch up with the ever increasing



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demand for power, and the inevitable battle against insufficient loan funds.

The opportunity of discussing your joint problems, of pooling your latest information and so forth, must give you added stimulus to continue the fight for power—literally, if not metaphorically.

Mr. President, I trust that the deliberations at this Convention will be beneficial and fruitful, and that all our visitors will have a happy stay in Salisbury, and that they will make many friends.

And having just spoken about power, Mr. President, I have very great pleasure in introducing to you our Federal Minister of Power, Sir Malcolm Barrow, who is really a powerful Minister in many respects, for his portfolio carries, not only power but the burden of commerce and industry as well.

Ladies and Gentlemen, Sir Malcolm Barrow.

SIR MALCOLM BARROW: Mr. President, Mr. Mayor, Ladies and Gentlemen, since I have been a Minister of the Government of the Federation of Rhodesia and Nyasaland, it has been my pleasure to address many meetings of representatives of the various branches of commerce and industry, but this occasion is the first upon which I have been able to speak to a gathering of representatives responsible for the public supply of electricity, not only within the Federation but in almost the whole of Southern Africa. I am particularly pleased to have this opportunity because, holding as I do the two portfolios of commerce and industry on the one hand and power on the other I fully appreciate how commercial and industrial development depends upon the availability of adequate and economical supplies of electrical power.

Present at this gathering also are affiliated representatives of the largest manufacturers of electrical equipment with factories situated throughout the world, so that it is impossible to over-rate the importance of these Annual Conventions of Electrical Supply Engineers as a forum where the problems, both technical and economic, of this rapidly expanding industry can be discussed. It is indeed to the credit of the municipalities of Southern Africa they have

been prepared to sponsor this Association and have so widened the scope of the Convention that representatives of the electricity industry as a whole are able to attend and take part in your deliberations.

The majority of people present today have travelled across our borders and I would especially like to welcome them to our young and virile country. Many of the problems which the Union and the Federation have to face spring from the same sources and while we do not always seek the same solutions I think I can safely say that there is a remarkably high degree of understanding between us. It is therefore very pleasing to me to see that in the field of municipal electricity supply as in so many other fields delegates of the Union and of the Federation should meet to discuss their problems together.

The municipalities and similar local government bodies not only in Southern Africa but throughout the world, have been in the forefront in making available public supplies of electricity and in many instances have laid the foundations upon which today's electricity supply industry has been built. It was explained to you at your 29th Convention last year how the present tendency was towards larger generating units; that tendency is inevitably accompanied by the need to set up authorities to operate extensive systems of inter-connected generating stations and transmission lines. In this development the undertakings of local authorities will continue to play a vitally important part; and indeed it is because of their pioneering work to a great extent that it becomes possible to build a superstructure on the foundations which local authorities have laid.

Here, in the Federation, the process to which I have referred has been accelerated by the presence of vast sources of hydro-electric power which can be developed only in large units beyond the financial resources of power requirements of any one of the existing electricity supply authorities. As a result we have recently enacted legislation in this country to set up an authority which can construct and operate the large units which are available. We are fortunate indeed in having three

fine possibilities for the development of hydro-electric power on the Zambesi, Kafue and Shire valleys and considerable progress has already been made on the first of them at Kariba.

I understand that it was your wish that a short resumé on the Kariba scheme should be given by the consultants concerned and presented at this Convention. Tenders for the major works involved are now under examination by those consultants, therefore it is perhaps not very appropriate for them to undertake anything of this nature at this juncture. But so that you are not entirely disappointed I hope that I may be allowed to give you what might be called a layman's idea of Kariba setting out what are the main constituents and what is its cost.

I know the close affinity between civil engineering and electrical engineering in the field of electricity development, and it will be impossible for me to separate the one from the other in the information which follows.

The site of the Kariba scheme is on the Zambesi river approximately 50 miles South of Chirundu, in an exceedingly wild and remote area which is, nevertheless, approximately in the centre of a belt of country running through northern and Southern Rhodesia which uses about 97% of the electricity of the Federation. The flow of the Zambesi is a seasonal one and is subject to a fairly wide variation between the high and low water stages. The economic production of power in the Kariba Gorge requires the concentration of head by construction of a single large dam which, by creating an immense reservoir, serves at the same time to provide the necessary regulation of flow. The dam wall, which will be some 400 ft. in height from the river bed to the roadway that will cross the top, will create the largest man-made lake in the world. The length of the lake will be some 140 miles with a maximum width of 20 miles, an average width of 12 miles, and a maximum depth of 390 feet. The lake will store about 140 million acre feet of water and of the total flow of the river it is estimated that 84% will be available for generating power, 9% will be lost by

evaporation, and 6% will go over the spillway. The Zambesi's normal flow varies between 15,000 and 200,000 cubic feet per second and from that variable flow when it is regulated by the Dam we expect to be able to draw a continuous 39,000 cubic feet per second, equivalent in terms of energy production to 7,650 million kWh. a year.

The dam itself will be of pure arch design and will contain about 1,200,000 cubic yards of concrete to be placed in 3½ years. During the two heaviest years of construction approximately 55,000 cubic yards of concrete a month will have to be placed. This amounts to about 3,100 tons a day. The spillway in the centre section of the dam will have a total effective length of 308 feet and has been designed to pass 300,000 cubic feet per second in full flood.

River diversion works are exceedingly complicated and involve the construction of coffer dams, a diversion channel and a diversion tunnel. We expect the river to be closed by the end of 1957 and following that the main dam will be heightened to continue the impounding of water. The dam should be completed by the end of 1960 and with average rainfall the reservoir should be full by 1963.

Electrical development includes the construction of two underground power stations, one on the north bank and the other on the south bank of the river. Each power station will contain six 140,000 bhp. vertical shaft Francis turbines, each driving a 100 mW. alternator. Each of these machines to be installed will have an output approaching that of the largest existing thermal station in the Federation. The development is divided into two stages. The first stage comprising the construction of the main dam, the power station on the north bank and the installation in it of five 100 mW. sets. This is estimated to cost some £80 million and the first power is expected to be produced early in 1960 and the first stage to be completed in 1963. Construction of the second stage will proceed as necessary and includes the installation of the sixth set in the South bank power station and the construction of the northern power station with a further six sets. Completion of both stages

will depend to a great extent on the growth of demand, but we anticipate that this should be achieved by about 1972.

The energy generated will be transmitted over an extensive transmission system involving the construction of the following lines: Kariba to Kitwe, 275 miles; Kariba to Norton, 170 miles; Kariba to Umnati, 220 miles; Salisbury / Norton / Umnati / Bulawayo, 270 miles, giving a total length of transmission lines of 935 miles. Construction of the transmission system, like other components of the scheme, will be progressive. Steel cored aluminium conductors will be used and transmission will be at 330,000 volts.

The cost of the whole scheme, that is, stages 1 and 2 combined, will amount to about £113 million. You will appreciate that this is an enormous investment for the Federation but, looked at in its proper light, it is certainly the wisest step to take. Kariba will have an ultimate capacity of 1,200 mW. To provide equivalent thermal output would cost £101 million, about £12 million less than Kariba. Against this a comparison of production costs of hydro-electric power from Kariba and thermal power shows an accumulated saving of £44 million in favour of Kariba by 1971, and by that time the annual saving will be running at the rate of about £10 million. From 1960 onwards the supply of power from Kariba will avoid further investment in coal mining, railway transport and water supplies which would otherwise be required to expand production from thermal stations. This should be a very great relief to the claims for investment in basic services.

The cost of power delivered from Kariba at the main sub-stations is estimated at 0.869d. per unit in 1961, 0.588d. in 1961 and thereafter downward to 0.283d. in 1972. Power from Kariba will be supplied to the Rhodesian Congo border power corporation in Kitwe for distribution on the Copperbelt, and in the Salisbury, Bulawayo and Midlands areas of Southern Rhodesia. Kariba will be interconnected with the municipal power stations of Bulawayo and Salisbury and with the power station of the Southern Rhodesia Electricity Supply Commission at Umnati. The most suitable

methods of operating those power stations when interconnected with Kariba to form a unified system are now being examined.

It is apparent that while the major contribution to the system power input must, for economic reasons, be drawn from Kariba installation, the municipal stations will still have a vital part to play, though the proportion of base load which must be allocated to the thermal stations to balance security of supply with optimum economy, is a problem of considerable complexity.

Although the electricity supply industry of the Federation must at present be regarded as small when compared with that of the Union of South Africa, the high rate of industrial development and the expansion of the mining industry, particularly in the Copperbelt, are making such demands upon the future supplies of electrical power that engineering problems of the same order of magnitude are now common to both countries. The capital city of the Federation is therefore highly appreciative of the distinction which the Association of Municipal Electricity Undertakings of Southern Africa has bestowed upon it by deciding that Salisbury in this, its coming-of-age year, shall be the venue of your 30th Convention.

I have great pleasure, Mr. President, in declaring this Convention duly open.

THE PRESIDENT: Mr. Honourable Minister, Mr. Mayor, Ladies and Gentlemen, I am sure that I voice the sentiments of all present when I say, how grateful we are to Sir Malcolm Barrow for so kindly opening our Convention and for his most interesting address. I may say, Sir Malcolm, that we in the Union have followed recent development in the Federation's Supply Industry with great interest, and have even argued on the relative merits of Kariba and Kafue. We appreciate that you and your Government were called upon to make some exceedingly difficult decisions and having taken those decisions, it was gratifying to hear that this great project is now being pressed forward with great energy. May I convey to you, Sir, and to your Government this Association's best wishes for the successful outcome of your effort. To you Mr. Mayor and to your Council I convey grateful thanks for having

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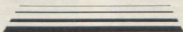
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invited us to this wonderful city. We appreciate that you, your Council, and officials are hard pressed to cope with the phenomenal development of Salisbury and consequently your hospitality in the time of stress is all the more appreciated.

We also much appreciate your kindness, Sir, in honouring us with your presence this morning. (Applause.)

The next item on our Agenda is the Election of President and I call for nominations for the office of President for the ensuing year. Will speakers kindly give us their names before addressing the gathering.

Mr. SIBSON (Bulawayo): Mr. President, a year ago when we met in the capital city of the Union of South Africa I had the pleasure of seconding a proposal that Mr. J. E. Mitchell should be your Vice-President. Mr. Mitchell on that occasion was absent, he was overseas at the time, and I was therefore able to make a few remarks about him that perhaps might not have been made in his presence. He is, however, here this morning, so I will have to be a little more polite, perhaps, Mr. President, it does give me very great pleasure indeed, to propose Mr. J. E. Mitchell as your President for the ensuing year.

Mr. Mitchell has in recent years made considerable contributions to the work of this Association and although both he and myself, while serving on your executive have of necessity perhaps on occasions looked at your problems from a slightly detached point of view, I do not think that that has been altogether a disadvantage. There have been occasions in my own experience when it has been a very great advantage to sit in a chair and tell some of the Union Government officials what we thought of them in a way that I think you, or some of you, might have found a little more difficult.

Mr. Mitchell will be able to deal with them, I am sure, in just the same way and, I think, perhaps to your advantage.

Mr. President, I do therefore wish to nominate Mr. Mitchell not only because of the advantages to which I referred, but because of his manifest ability, his goodwill, his interest and the experience he has gained in the conduct of municipal affairs.

I do therefore propose Mr. Mitchell, Mr. President, for your President for the incoming year. (Applause.)

Mr. BLIGNAUT (Pretoria): Mr. President, being a comparatively new member of A.M.E.U. I have not had the pleasure of knowing Mr. Mitchell for any length of time. It is, however, not necessary to know a man for a very long time to appreciate his abilities. I therefore, have pleasure in seconding your proposal, Mr. Sibson. Thank you.

THE PRESIDENT: Well, I must ask if there are any further nominations . . . In that case, Ladies and Gentlemen, I have very great pleasure in declaring Mr. J. E. Mitchell, City Electrical Engineer of Salisbury, your President for the ensuing year.

Mr. Mayor would you do us the honour of investing him with the chain of office.

THE PRESIDENT (Mr. J. E. Mitchell, Salisbury): Thank you, Sir (Applause).

Mr. Mayor, Honourable Minister, Ladies and Gentlemen. In thanking you for the honour that you have conferred upon me and upon this City I nevertheless realize the responsibility which this office engenders and it was not until just now that I realised why the Mayor in office wears a chain. I see it is always to remind him of the weight of his responsibilities, and one of mine is to proceed with the Agenda of this Convention as quickly as possible.

Before doing so I would like to take this opportunity to thank my proposer and my seconder for their eulogies which are completely undeserved, but nevertheless heartwarming, and to proceed with the next item on the Agenda. My first duty unfortunately, is a sad one. We have during this last year lost one of our colleagues, Mr. Horrell. Mr. Horrell, as you know, was the Secretary of this Association from January 1941 to January 1945, after he retired from the post of City Electrical Engineer, Pretoria; and I would like as a tribute to his memory, and in sympathy with those bereaved, if you will stand for a few moments in silence. . . . Thank you.

I would now like to welcome our distinguished visitors from Engineering Institutions, Scientific Associations and Bodies, Chambers of Commerce and

Industry, but I will not obviously give them all by name. Usually the next item on the Agenda is the next Venue for this Convention but as the decision is likely to take a little longer than normal, after I have made a few announcements we will adjourn for tea.

Now first of all, to get to the Tea Kiosk where tea is being served you go out by the front door, and you will see a path into the park and if you follow the notices you will get to the Tea Kiosk. After tea, when the warning bell goes, I will be pleased if you will all go to the Stands which you will pass on the way to the Tea Kiosk, which again is well noticed, for the taking of the Official Photograph.

I don't know if you have had time to read in the folder, the form about the Official Photograph, but in order to obviate the great difficulties which we always have in finding the names of people on the photograph we are going to have rather an innovation this year. When you are all on the Stands, you will be issued with cards with letters and numbers. We want you to write your names and towns on that card. The first photograph will be an entirely unofficial photograph with the cards held up in front of you, so that the photograph will have your face and your letter and number underneath it. That photograph I assure you, will be destroyed when it has been used for the names. (Laughter.) That means that we can actually have the proof on the Board next morning with the names underneath it, so I hope you will collaborate with us in that regard.

I also want you to notice that the venue for the lunch on Wednesday has been changed to the Princes from the Drill Hall. We couldn't get you all in the Drill Hall so we had to change it to the Princes. We do not want any replies to the invitations, obviously, except from those who will not be coming to the Lunch, as we have to fix up the actual table seating. We would like to know as soon as possible this morning whether you will be coming to the Lunch and whether your ladies are coming to the Lunch as well.

There is also another form which you have in regard to visits for the Wednesday afternoon. If we could have this filled in

this morning it will assist us greatly in regard to tea and cakes for instance, on that afternoon. We should hate to allow for 50 and find 150.

In regard to the Ladies visit to the Tobacco Auctions, you will also notice that we have had to split that into two otherwise it would be too big a number for anybody to explain what is happening. Some of the Ladies go on Wednesday morning, and some go on Thursday morning. Those who go on Thursday morning will be taken by bus direct back to this Duthie Hall after they have had tea at the Tobacco Auctions preparatory to the closing session. I think those are all the announcements at the moment. Ladies and Gentlemen, and I hope His Worship the Mayor and the Minister, Sir Malcolm Barrow, will join us not only at the Tea Kiosk, but also for the photograph afterwards, if they can spare the time. Thank you. (Applause.)

10.30 a.m.—Refreshment Interval

11.30 a.m.—Convention Resumes

THE PRESIDENT: The next item on the Agenda is the venue for the next convention and this has been discussed by your Executive and there is something different this year. As you know there has been among some of us possibly a feeling that the President has been elected because of the size of his town and not because of the work that he has done for the Association. I am not saying that has happened before or might happen in the future, but it is difficult when a delegate, member of the executive, or a member of the Association has given extraordinarily good service and yet belongs to a town which is of insufficient size to accommodate a convention of this nature. We have therefore given some thought to this, and, as you know when we altered the constitution to bring in the Commercial Delegates, we also had something like this in mind. In the belief that sometime in the future we might be able to run our Convention rather on the same lines as those run in Britain, where the actual Convention itself decides on the venue and decides on its own President irrespective of the position of the

venue, we have made enquiries to see whether this can be done next year.

We have been promised the utmost co-operation by the town of Margate, and at Margate we are given to understand that there are necessary facilities to run a Convention of this nature. Consequently in making a proposal that next year's venue be Margate, it will obviously mean that whoever is the Vice-President, (because believe me I am not going to do the same work twice) will have to do a considerable amount of work as if the convention was in his own town or city. But it will mean that at any time now or in the future, where we consider that a man should be honoured, we can so honour that man without bothering as to the size of his town.

It is not, of course, our idea that this will happen every year, every two years, or every three years, but only when the executive thinks that there is actually need for it.

Before I actually put that proposition to the vote, I am actually going to call for nominations for the Vice-President and then I am going to put both these propositions up together. Now I call upon Mr. Jack Downey to speak on that matter.

Mr. J. C. DOWNEY (Springs): Mr. President, Ladies and Gentlemen. It is indeed to me a great pleasure to stand before you to nominate one who has rendered such yeoman service to this Association, one whom we all know so well, one to whom I have always attached a phrase from Shakespeare's "As you like it" when he first joined this Association. As most of you know, Shakespeare made mention of the "shining morning school boy creeping like snail unwillingly to school". We have this "shining schoolboy" unwilling to take executive office in the first instance, unwilling to take honours, but one who is never lacking at any time to do a job of work, whether it be onerous or otherwise. One that seemed to have a flair for doing a job of work and doing it with a very pleasant smile on his face, we can do no more signal honour than nominate him for the position as Vice-President of this Association. For years he has been one of your back room boys writing reports, taking meetings at very great inconvenience

to himself and with great difficulty in getting away from the onerous duties of his job. I think today it will be a great honour to us and to him to nominate him for the position of the great duty of Vice-President of this Association. Ladies and Gentlemen I have great pleasure in nominating Mr. J. L. van der Walt, of Krugersdorp, for Vice-President for the year 1956-57. (Applause.)

Cr. JONKER (Krugersdorp): Mr. President, Ladies and Gentlemen. I have much pleasure in seconding the nomination of our Electrical Engineer from Krugersdorp as our Vice-President. Thank you. (Applause.)

THE PRESIDENT: Now before putting both those items to the vote can I ask for any further nominations for Vice-President . . . Well, as there appear to be no further nominations for Vice-President, I can obviously declare that Mr. J. L. van der Walt, Town Electrical Engineer of Krugersdorp, is hereby duly elected Vice-President for this Association for the ensuing year. (Applause.)

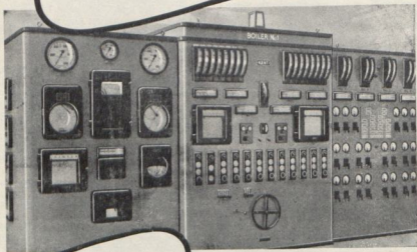
Mr. J. L. VAN DER WALT (Krugersdorp): Mr. President, Ladies and Gentlemen. You have indeed bestowed a great honour upon Krugersdorp and myself in electing me your Vice-President for the ensuing year. I realise that there is a difficult task ahead in arranging for a conference at Margate, away from one's home town, but I can assure you, Mr. President, I will be at your side and I will not let you do the job twice. I will endeavour to do my utmost to make that Convention at Margate a bumper Convention and a great success, as far as our Association is concerned. To my proposer, Mr. Downey, and his seconder, Mr. Jonker, thank you very much for your very flattering and encouraging remarks you made about me. Mr. President, to you I wish a very happy year of office, and I can assure you that I am at your side in any assistance you may require of me, so please, if there is any way in which I can lighten your duties, do not hesitate to ask.

Nogmaals, Dames en Here, baie, baie dankie. Ladies and Gentlemen, Dames en Here, baie dankie vir die groot eer wat jy my aanwys.

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In conclusion, although the conference is not being held at Krugersdorp, you will all be welcome to Krugersdorp as long as you do not all come at once.

THE PRESIDENT: Thank you, Mr. van der Walt, and thank you for your assurances I shall certainly make use of them. Can I take it, therefore, gentlemen, that you agree with the Executive's suggestion that the venue for next year shall be at Margate. Agreed. Thank you very much.

Now I understand there are some official visitors here who would like to give us their greetings. Will they please, or any delegate please, before he speaks into the microphone give us his name and town or what he is representing. Will they please do this and speak into the microphone each time because we are using a tape recorder instead of the ordinary Hansard writers.

Mr. R. W. KANE (President, South African Institute of Electrical Engineers): Mr. President, and Gentlemen, on behalf of the S.A.I.E.E., and also on behalf of the S.A.I.M.E., it gives me great pleasure first of all to thank your Association for the individual invitations to be represented here today, and they wish to convey their good wishes to you for a successful year of office and a happy and successful Convention. (Applause.)

THE PRESIDENT: I hope you will say that we appreciate those remarks very much indeed. Thank you.

Mr. J. C. FRASER (Johannesburg): I, Mr. President, wish to convey hearty greetings from the Safety Precautions Committee, as their Chairman I have been nominated to represent them here today. I have no doubt that several members will make very much use of the fact that there is a member of Safety Precautions Committee present at this Convention, before the Convention is over. We wish you success, Sir, in your year of office and wish the Convention all success and the members while staying in Salisbury. Thank you. (Applause.)

THE PRESIDENT: Thank you, Mr. Fraser, I hope you will convey back to the Safety Precautions Committee our good wishes, and the fact that certainly we shall use their services to our utmost ability. Thank you.

Mr. MILTON (Escom of the Union of South Africa): Mr. President, I have been asked to convey to you the greetings of the Chairman of the Electricity Supply Commission who, unfortunately, has to leave on a trip overseas very shortly, and therefore was not able to be present himself. He wishes you and this Convention every success.

THE PRESIDENT: Thank you, Mr. Milton.

Mr. ISAAC (Johannesburg): It is my very great privilege and pleasure to represent The Institution of Certificated Engineers at this Convention and to have the opportunity to record my Institution's appreciation of the honour that attaches to your kind invitation.

I bring to you the greetings of my Institution and its very good wishes, to which I will also add my own, for the success of this Convention.

THE PRESIDENT: Thank you, Mr. Isaac.

Are there any further greetings. As there are no further greetings, I will ask the Secretary to read out any apologies which have been sent in and I have one or two of my own, one at least of my own to follow after he has given you his.

THE SECRETARY: Mr. President, Ladies and Gentlemen. We have a number of apologies this morning:

Mr. Turnbull, Vereeniging, was unfortunately taken ill a few days before leaving for this Convention.

Mr. W. L. King, S.A. Railways; Mr. Bellad-Ellis, East London. Mr. D. Bradley, Port Elizabeth; Chief Inspector of Factories, Department of Labour, S.R.; Director of Public Works, Union of South Africa; The President of the S.A. Council for Scientific and Industrial Research; The Chairman of the Industrial Development Corporation of South Africa; The Representative of the Fuel Research Institute of South Africa; The Provincial Secretary, Natal; The Provincial Secretary, Orange Free State; The Director of the Federation of Rhodesian Railways; Mr. J. S. Clinton; Professor Bozzoli, University of Witwatersrand; Van der Bijl Park Municipality; Ficksburg Municipality; The Borough of

Greytown; Matatiele Municipality; Middelburg, Transvaal, Municipality; Oudtshoorn Municipality; Somerset West Municipality; Upington Municipality; Umtata Municipality; Walmer Municipality. Winburg Municipality; Mr. Hafele, Bloemfontein; The Borough of Port Shepstone; and lastly the Borough of Stanger. Thank you, Mr. President.

THE PRESIDENT: Thank you, Mr. Secretary.

The one that I do wish to mention firstly is Mr. Bellad-Ellis, one of the foundation members of this Association, who desperately wanted to come up here and made his arrangements, but at the last moment found that he could not do it. Mr. Bellad-Ellis, of course, is 86, and, with your permission I think, (I have actually written to Mr. Bellad-Ellis), possibly the Secretary could send your best wishes. (Applause.)

Another one which I do wish to mention is Mr. Rettie. At the last convention which was held in Salisbury, Mr. Rettie was the Chief Electrical Engineer of the Rhodesia Railways. As quite a considerable number of you know, he has been struck down with an infirmity for many years now, and is completely crippled and living in Fish Hoek. I thought you might like, as this conference is again held in Salisbury, a letter to be sent wishing him all the best from this convention. He would like to be remembered. (Applause.)

And last but certainly not least we have a letter from Clarence (C. Kinsman), which is addressed as a matter of fact to Mr. Hugo.

"Whilst asking you to offer my apologies to the conference for any non-attendance on this occasion I would ask you to tell my erstwhile colleagues that I shall miss their company and that goes for their ladies too. Among all the trials and tribulations which dog the steps of a Municipal Electrical Engineer I find that the Convention provides an inspiration and an oasis. Their fellowship and conviviality mean a lot to me." (I understand his oasis when he talks about conviviality). (Laughter.) "My wife and I have you in our minds between the 7th and the 10th. Please give two messages: Hearty congratulations to Jimmie Mitchell, (and the other one is in Afrikaans, I don't know whether I can make this one)

"Sirgut man my vriend(?)" (Is that right?)
"With best wishes to you and Mr. Hugo.
Yours sincerely, Clarence".

We now come to the item on the agenda calling for nominations for the executive for the ensuing year. Before we actually get to that item, may I say that at the meeting of the executive it has been decided next year to put forward an amendment to the Constitution which we have always mentioned at these Conventions, but we have never actually introduced. That is to try and endeavour wherever possible to see at least that every Province (and this is considered a Province for this purpose), that is five, are represented. In this case, of course, for your information, I, of course, do not stand for election and represent the Federation; Mr. Hugo, Past President, is Transvaal; Mr. Muller is Past President, and is Orange Free State; Mr. Van der Walt is also Transvaal. So in other words, three provinces at least are already represented.

Now can I have names and nominations, please, and will you please not forget to give your name and town before speaking into the microphone. Will you please come to the microphone, otherwise we cannot record.

Cr. MARAIS (Johannesburg): Mr. President it gives me very much pleasure to nominate Mr. Bobby Kane for the Executive of this Association.

A SPEAKER: (Can we have the mike at this end please—Laughter). I have much pleasure in seconding that.

Cr. R. L. DE LANGE (East London): Mr. President, in view of the fact that you have left the one and only Province in South Africa, the Cape Province, out of it, I am going to nominate Mr. Percy Giles, City Electrical Engineer, East London. Thank you, Sir.

A SPEAKER: I have pleasure in seconding that, Mr. President.

Mr. VERGOTTINI (Brakpan): Mr. President, I have much pleasure in recommending Mr. Lombard from Germiston.

Mr. SMITH (Boksburg): I have much pleasure in seconding that nomination.

Cr. L. P. DAVIES (Springs): Mr. President, I would like to nominate Mr. Jack

Downey from Springs as a member of the executive.

Cr. A. MARKMAN (Port Elizabeth): I second that.

Cr. C. Young (Pietermaritzburg): I have much pleasure in nominating Mr. Simpson of Durban, Natal.

Mr. HALLE (Pietermaritzburg): I would like to second that.

Mr. R. W. KANE (Johannesburg): Mr. President, I would like to nominate Mr. Chris Downie of Cape Town.

Mr. FRASER (Johannesburg): I have much pleasure in seconding that.

A SPEAKER: Mr. President, has Mr. Nobbs of Port Elizabeth been nominated yet? No. Mr. President, I have great pleasure in nominating Mr. Murray Nobbs, City Electrical Engineer of Port Elizabeth.

Mr. HUGO (Pretoria): I have pleasure in seconding that.

THE PRESIDENT: May I propose Mr. Sibson of Bulawayo?

Mr. GRIPPER (Port Elizabeth): I would like to second that, and would like to nominate Mr. Hallé of Pietermaritzburg.

A SPEAKER: I have pleasure in seconding that.

Mr. MULLER (Bloemfontein): Mr. President, may I nominate Mr. Rossler of Kroonstad, please?

Mr. INGLIS (Pietersburg): I have pleasure in seconding that.

THE PRESIDENT: Are there any further nominations? We have ten for six places at the moment.

Now first of all, of course, the voting: only Engineer Delegates and one Councillor Delegate from each town or city can vote, that is two per Municipality only. Associated members, visitors, etc., do not vote.

What I suggest is this, that you take your sheet of paper off your small pads, and write all the names down as we give them to you. Then when it comes to voting all you have to do is to cross off, so as to leave six names not obliterated. If you will write these names down as the Secretary reads them out slowly, we can proceed to voting.

THE SECRETARY: Are you ready Gentlemen? Mr. Kane, Johannesburg; Mr. Giles, East London; Mr. Lombard, Germiston; Mr. Downey, Springs. Mr. Simpson, Durban; Mr. Downie, Cape Town; Mr. Nobbs, Port Elizabeth; Mr. Sibson, Bulawayo; Mr. Hallé, Pietermaritzburg; Mr. Rossler, Kroonstad. Thank you.

THE PRESIDENT: May we have two scrutineers please, I suggest Mr. Milton for one, he usually does it; and possibly Mr. Bishop. If you would give them some time to cross out those and leave six names not crossed out please and then hand to the scrutineers.

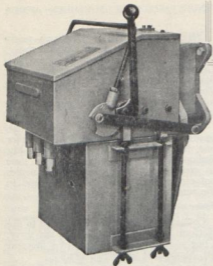
Pause.

Councillor Davies please come up to the platform and Mr. Hallé. Yes I am sorry. I beg your pardon I forgot. Just a moment Mr. Simpson if you don't mind.

Yes I did forget Mr. Simpson had an apology which he had to read out and I am afraid I went a bit too fast. Mr. Simpson.

Mr. SIMPSON (Durban): Mr. President, Gentlemen, the older members of the Association will remember Mr. Poole, one of the foundation members who is still living in Durban and before I came up to the Convention he asked me if I would present his apologies. I said alright if you would like me to present your apologies write a little letter or a little note, and I will bring it up for you and he was very pleased. Mr. Poole is getting very old now. He is over 80 and is not very well, doesn't enjoy very good health, so I will just read these few notes that he has put down.

"I am sorry for the oft repeated apologies for being unable to attend our conventions that I felt that I should go one better this year, than to continue the brief form of apology, especially when there is another way of expressing myself. I am therefore taking an opportunity of asking my friend Mr. Simpson, City Electrical Engineer of Durban, who in my capacity of Assistant Borough Engineer of Durban I got to know quite well, to convey to the Convention my apologies and read you a message, I shall express my thoughts as I write, that your Convention may be successful as is usually the case, is my sincere wish. And my congratulations go out to the President you



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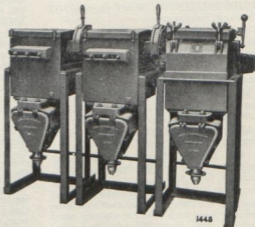
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will be asked to elect, as well as the members of the executive who will assist in carrying the responsibilities of the Association during this next session.

"It is pleasing to know that the membership is still going strong, but with the passing of time, changes in personnel, it will not be too easy for the older ones particularly, to adjust ourselves to the everchanging conditions resulting therefrom.

"I well recollect the early days of the Association and the pleasure afforded me of being one of the 17 municipal electrical engineers who met in Johannesburg in 1915 as foundation members of the present body which has now grown to approximately 250 including 110 council members. Little did I think then that I would later be honoured by being elected an honorary member of the Association as I have been for some years now, or that I would ever be looked upon as a sort of grandfather municipal electrical engineer, as I feel I am with such a lot of the youngsters busying themselves about. I close these few remarks with the hope that when the next Convention is held in Durban, I may be able to confirm in person all that I wish you now. Good luck to you all." Signed E. Poole. (Applause.)

THE PRESIDENT: Is it your wish, Gentlemen, that Mr. Simpson convey to Mr. Poole the best wishes of this Association and long life in his retirement. (Applause.) Thank you. Well, would you mind doing that for us Mr. Simpson. Thank you.

I am now going to call upon our immediate Past President, Mr. Hugo, to deliver his Valedictory Address.

VALEDICTORY ADDRESS

by D. J. HUGO

In opening the proceedings of our last three Conventions the Administrator of the Transvaal, the Administrator of the Orange Free State and the Chairman of the Electricity Control Board each, in successive years, laid emphasis on the need for promoting supplies of electricity to prospective consumers in rural areas and stressed the advantages of electric power supplies to the farming community.

On each occasion I sensed a challenge to local authorities to play a more active

part in the development of rural areas particularly in so far as electricity supply is concerned.

In choosing a subject for my valedictory address I thought I might have something to say on rural electrification in the light of experience gained by Pretoria which has an authorised supply area some 20 times the size of its municipal urban area.

The Electricity Act of the Union of South Africa was promulgated in 1922 and was hailed at the time as a masterpiece of its kind. During the 34 years through which the Act has been in force there has been only one amendment of any consequence which provides for the payment by the Government of a subsidy in areas where an economic supply cannot be furnished. To my knowledge no application has ever been made by any undertaking for a subsidy.

It is reasonable to suppose that legislation controlling a dynamic industry would have to be amended from time to time in the light of experience and changing conditions and with a view to ensuring continued co-ordinated development of the electricity supply industry.

However this has apparently not been considered necessary in the case of the Electricity Act with the result that this legislation is now unfortunately in some respects very much out of date.

An example of the Act's shortcomings came under discussion at our last Convention when it was reported that one of the Reef municipalities does not enjoy the sole right of supply within its own boundaries and is debarred from supplying certain of its ratepaying industries despite the fact that it can do so at the same tariff as the present supplier. Incidentally the representations which have been made in this matter by our Association in collaboration with the Transvaal Municipal Association have so far not yielded any result.

The underlying principle of the Act is a cheap and abundant supply of electricity for all purposes. In the case of mining and industry I would say that the aim has been realised but certainly not in respect of rural electrification.

Farmers, usually regarded as the apple of the Government's eye, have, in general,

been singularly unsuccessful in their efforts to obtain supplies of electricity.

There are of course a number of areas in the Cape and Natal where groups of farmers are receiving supply but no one would say that rural electrification is being expanded with any vigour nor is it the responsibility of any particular supply authority.

Municipalities are under no obligation to extend their supply mains beyond the municipal boundaries but may do so after obtaining permission from the Electricity Control Board.

Many municipalities however have, in the national interest, endeavoured to do their share in carrying out the objects of the Act and are furnishing supplies in areas beyond the municipal boundaries.

Undertakings are nevertheless put to much inconvenience and expense in connection with rights of way and wayleaves for their distribution mains. Mr. Dunstan found it necessary to point out in his paper presented to us last year that electricity undertakings should be in legal possession of all the rights and powers required if rural electrification is to progress faster than at the snail's pace evident to-day.

It is clear therefore that the first step towards accelerating rural electrification is a revision of the Electricity Act and any other legislation controlling electricity undertakings to permit of the planning and co-ordination of the supply of electricity in the Union's rural areas; to facilitate the distribution and to remove irksome limitations and restrictions in the design and location of transmission lines and equipment.

There can be little doubt that the most suitable body to give a rural supply is the urban authority. A municipality's electricity tariff is, however, designed on the basis of supply only within the municipal boundaries so that when supplies are furnished beyond such boundaries it becomes necessary to impose a surcharge. Subject to guarantees of minimum revenue and a surcharge of about 25% on urban tariffs rural electrification can be said to pay costs within about 10 miles of the municipal boundary.

Rural consumers are very conscious of the fact that they pay more than the urban dweller and that from the point of view of continuity of supply the service to them is less reliable. They do not appreciate the fact that by virtue of their location close to a large city they enjoy privileges of services at particularly favourable tariffs. In consequence of the surcharge which he pays the rural consumer regards these services as his right in the same way that they are the right of any ratepayer, and is quite satisfied that any surcharge amply compensates the municipality for his lack of any contribution towards municipal assessment rates.

They are fully aware of their rights under the Electricity Act and in consequence frequently approach the Electricity Control Board with allegations that they are being overcharged by the municipality.

As a result of such pressure the Control Board calls upon the urban centre to justify its charges to rural consumers. The interesting point, however, is that tariffs within the municipal boundary are subject only to the approval of the Administrator of the Province whilst rural tariffs require the blessing of the Control Board. The Control Board therefore has no alternative but to accept the urban tariff as a basis and must then endeavour to determine what surcharge is justified in order to cover the cost of supply beyond the municipal boundary.

Urban centres, particularly in the Transvaal, are being made to realise that by supplying electricity and other essential services to all and sundry on its boundaries serious repercussions can result. Various commissions have from time to time recommended that the area of jurisdiction of a municipality should be progressively extended so as to incorporate groups of people living on its boundaries where such groups rely for their existence on the mother city. If essential services such as water and electricity are available to such groups incorporation is resisted by them and gradually a number of independent self governing units arise to the disadvantage of the whole community.

Electricity enables the farmer to increase productivity and it is therefore in the

national interest that farmers should receive a supply. It is a moot point, however, whether a supply to people other than farmers living on a city's boundaries is of any benefit to anyone except the recipient. Under present circumstances with an economic limit for rural supplies of 10 miles from the municipal boundary it is doubtful whether the urban centre's distribution mains reach many people who are dependent on farming for a living.

The reply to the challenge that municipalities should do more in the way of rural electrification is therefore that under existing circumstances the disadvantages to the supply authority far outweigh the advantages to be gained by embarking upon rural electricity schemes. However, if legislation controlling the supply industry could be amended to delegate to urban supply authorities greater powers in respect of rural development and remove some of the more irksome restrictions to which I have referred, I am quite sure that local authorities would be willing to do their share in bringing power to the farming community.

I conclude by expressing sincere thanks to members for the honour conferred on me, and to the Executive Council and Secretaries, for their support and valuable assistance at all times.

To you, Mr. President, I wish a very happy and successful year of office.

THE PRESIDENT: Thank you, Mr. Hugo. I now call upon Mr. Hallé to propose a vote of thanks.

Mr. HALLE (Pietermaritzburg): Mr. President, Ladies and Gentlemen. Our worthy Past President has squared up to his task with the usual military efficiency and competence. As a matter of fact it suggests to me that he would like to give a military farewell to the problem, the difficulty that he mentions we all share, these worthy farmers came along and expect us electrical engineers to perform a sort of conjuring trick and produce supply to them. When we tell them the cost they feel we ought to take another lesson in conjuring. (Laughter.)

Mr. Hugo has mentioned something about a Government subsidy. We in transport matters have gained some experience in that, and I should warn you not to

expect one way traffic in money or get any idea that money is going to flow from the Government to you; that is quite the reverse direction of the actual facts. I would like as a sort of final thing, to say that if we go on expecting something for nothing we are all going to end up in paying double for everything. If a service is worth having it is worth paying for, and that, I think, should be the final conclusion on these rural supplies.

I wish to move a vote of thanks for a very direct and sincere paper in Mr. Hugo's always sincere style, and at the same time thank him for a very fine year of office. Those of us who have had problems have written to him; we have always felt we had had a friend, we have always felt we have had a man who will do his utmost for his fellow electrical engineers and his Association. I wish to move this vote of thanks both for his paper and for his very fine year of office. (Applause.)

THE PRESIDENT: And now to Cr. Davies to second that vote of thanks.

Cr. DAVIES (Springs): Mr. President, Ladies and Gentlemen, Mr. Hugo's remarks centre round the question of the right and the obligation to supply electricity. This, Mr. President, is the major question today facing all Local Authorities. Since the Electricity Act was passed in 1922, South Africa has undergone an industrial revolution; it has become highly urbanised. The whole picture has changed completely; the time has arrived when the Act should be revised so as to fit in with the new circumstances. In many cases the right and duty to supply electricity is today uncertain and the Act should be revised to clearly define the right and the obligation to supply so as to fit modern circumstances and let Local Authorities know where they are to stand in the future.

In regards to the supplies of electricity, Mr. President, the majority if not all of us appreciate Mr. Hugo's reminding us once again of this problem. I personally feel that this Association should give this matter top priority. Mr. President, I would like to thank Mr. Hugo on behalf of all present for his timely address and I now have much pleasure in seconding the vote of thanks of Mr. Hallé of Pietermaritzburg. (Applause.)

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THE PRESIDENT: May I ask you to show your approval of that vote of thanks in the usual way. (Applause.) I just want to remind you that if there are any further questions for the Engineers' Forum tomorrow afternoon, will you please let Mr. Downey have them.

We will now adjourn for lunch and resume at half past two.

12.30 p.m.—Luncheon adjournment.

2.30 p.m.—Convention Resumes.

THE PRESIDENT: Mr. Kane has arrived, we can start. (Laughter.)

I have the results of the voting for the Executive. Your Executive for the ensuing year is as follows:

Mr. R. W. Kane, Johannesburg; Mr. C. G. Downie, Cape Town; Mr. J. Downey, Springs; Mr. C. Lombard, Germiston; Mr. A. R. Sibson, Bulawayo; Mr. R. M. O. Simpson, Durban.

I declare those engineer members and their towns or cities duly elected members of the Executive Council for the ensuing year. (Applause.) I wish to present hearty congratulations to those engineers.

Mr. MULLER (Bloemfontein): Mr. President, I think we discussed this matter in executive and where the Free State is only represented by one engineer member ex officio I think the rule was that the Councillor member for that engineer is co-opted. Am I right?

THE PRESIDENT: Yes, Mr. Muller, I was not actually at the last Convention but I see that actually did happen and I don't know any reason why we should not co-opt the Councillor member for Bloemfontein as previously. I think that is a very good suggestion and I think we should carry it out because it is in line with what we suggested for our amendment to the Constitution.

Now at the meeting of the Executive yesterday we carried out a function which is the privilege of the Executive, in electing honorary members, but I am going to go back in time and actually re-do what we did in the Executive and allow the proposers and the seconders to actually propose

those honorary members all over again. I will then ask you whether you agree with the action that the Executive council took in this matter.

First of all I am going to call on Mr. Hugo to address you on that matter.

Mr. HUGO (Pretoria): Mr. President, Gentlemen, as you know the Association Constitution makes provision for the election of honorary members and defines honorary members as distinguished members whom the Association especially desires to honour for exceptional services rendered to municipal electricity undertakings. Up to the present, with one exception, only engineer members who have retired from municipal service have been elected. On the occasion of this Convention new ground is being broken and I am privileged to announce that your Executive have unanimously recommended that the following honorary members be elected: Alderman Morton Jaffray, Salisbury and Councillor C. E. K. Young, Pietermaritzburg.

Both these Councillors have rendered very valuable service to our Association and been on the Executive for many years. It has been a great privilege to me to have been associated with them over a period of some 10 years and I am delighted that this honour has been conferred on them. I wish Alderman Morton Jaffray and Cr. Young continued good health and happiness and hope that they will be able to serve with the Association for many years to come. Thank you. (Applause.)

THE PRESIDENT: Thank you, Mr. Hugo. Mr. Hallé.

Mr. HALLE (Pietermaritzburg): Mr. President, I have great pleasure in seconding this proposal. We are all very proud of the development of municipal undertakings both in this country and in the Union, but we are inclined to forget that all our plans and endeavour have to be piloted through the bottleneck of Council's authority by the Chairman of Committees; and these two fine Councillors have not only been doing that but between the two of them they represent over 20 years work on this Association. We can't very well declare them national monuments (laughter), but

at least we can show our appreciation of their sterling endeavour, an endeavour which has had the confidence not only of their burgesses, their Council, but this Association. I have the greatest of pleasure in seconding this proposal, especially my good worthy friend, Councillor Young, who I know so well. Thank you. (Applause.)

THE PRESIDENT: May I take it in the case of these two honorary members that everybody is in agreement with what the Executive has done. (Applause.) Before seeing whether these two honorary members would like to address you I would like to present my congratulations to these two worthy Councillors. They have been, as you have heard, members of this Executive, members attending as Chairmen of their committees for the last 10 years. Of course I don't know whether that is due to the fact that they are good Councillors or whether they have good engineers, but anyway they have been in the same position for 10 years. Thank you.

Alderman Morton Jaffray would you mind addressing the microphone or we can't record your speech please. (Laughter.)

ALDERMAN MORTON JAFFRAY (Salisbury): Mr. President and Gentlemen I would like to thank you for the very great honour that has been done to me this afternoon. I would like to thank the proposer, Mr. Hugo, and Mr. Hallé, for putting this proposition forward. I don't know that I like altogether the suggestion that I might be termed now a national monument, though I have had some considerable association with this Association.

It has, as has been said earlier today, grown tremendously since I was first privileged to play some small part in the proceedings. Nevertheless, I think that I hardly deserve this honour. I am quite sure that our friend, Jimmie Mitchell has had quite a hand in putting this proposition before this Convention, but I will deal with him in due course. Thank you very much. (Applause.)

THE PRESIDENT: Thank you, Mr. Chairman of my Committee. (Laughter.)

Cr. YOUNG (Pietermaritzburg): Mr. President, Gentlemen, I have had to thank

so many people in the past that I can assure you that this honour that has been conferred upon me is one that will gladden the hearts of my family. In that respect I do say the family because of the fact that I have been away so much on conventions that they deserve thought. Mr. President my Council has honoured me on those various occasions, and I also have been honoured by you conferring this life Vice-Presidency as something you can hardly expect to get. You do not pick one up in the roadway as it were.

Fortunately I have been honoured by the association of my engineer and in Charles Hallé he has probably got to do what he is told sometimes. But I look upon the immortal child, the immortal Charles, as one of those individuals who can generally get me out of a corner. So that you can understand that my work is being acknowledged, if I can say that word, is acknowledged but I have got to tack this particular honour on to Charles for the information and good nature of him.

Mr. President, I assure you one and all that I am very, very grateful for the big honour that you have conferred upon me. (Applause.)

THE PRESIDENT: Thank you, Alderman Young, I hope you remain the same as your name for a long, long while.

I would now like to call upon Mr. Chris Downie.

Mr. C. G. DOWNIE (Cape Town): Mr. President and Gentlemen, it is a great privilege for me and an even greater pleasure to propose as an honorary member of this Association someone who is extremely well known to everyone of us. I should say that outside the members of this Convention he knows our business better, or just as well, should I say, as we ourselves. I refer to none other than Walter Milton, the Chief Commercial Engineer of the Electricity Supply Commission.

(Applause.)

I have had quite a lot to do with Mr. Walter Milton in my own little sphere in Cape Town and I have a pretty good idea of the esteem in which the other municipalities hold Mr. Walter Milton. He

has been a guide, philosopher and friend to municipal electricity undertakings. There might have been one or two arguments at times, but I am quite sure that, as the adviser to Administrators through the Electricity Supply Commission, he has always held the interests of municipalities at heart. I think it is extremely fitting that Mr. Walter Milton should occupy, should fit in with the honorary members of this Association, and I have very great pleasure Mr. President in proposing Mr. Walter Milton. (Applause.)

Mr. MULLER (Bloemfontein): Mr. President, it affords me very great pleasure to second this proposal. I have known Mr. Milton before I was interested in municipal affairs, and I have had the good fortune of knowing him ever since. The first Convention I attended which was some 21 years ago, Mr. Milton was there and I don't recall missing him, I think he was missing once, but Mr. Milton, as Mr. Hallé said just now, if he had not been so virile and so verbose shall we say might have become a national monument. But we know him, each one of us knows him very well. He has been a friend to us all and he has been a personal link with the Commission, which sitting in Johannesburg is perhaps not so near to us as we would like them. Mr. Milton has always been a personal link through which you can approach the Commission, although of course the formal approach would not be through Mr. Milton. But he has been our friend there and he has been our advisor.

He has been capable of dealing with municipal affairs because he has been so intimately interested for so many years. Therefore, Mr. President, it affords me very much pleasure to again second this proposal. (Applause.)

THE PRESIDENT: Thank you, Mr. Muller. I presume that you all approve what the Executive has done in that case too. (Applause.)

Mr. W. MILTON (Johannesburg): Mr. President, Gentlemen, I don't think I deserve the praise that has been measured out to me by my friends, Mr. Chris Downie and Mr. Muller, but I must admit that I have had the interest of municipalities at

heart for a long period of time. I think my first convention dates back to about 1928, which is rather a long time ago. I have certainly missed, I think, on two occasions in that period of something like 28 or 29 years, but I do not think a higher honour could have been done me than you have conferred upon me this afternoon. I feel very deeply moved, to have brought in someone outside your organisation as you have done on this occasion, well I think its beyond words, its astounding! Thank you. (Applause.)

THE PRESIDENT: Thank you, Mr. Milton, I am sure we all wish you a long time to go to these Conventions, even after you have retired, we might use you on the other side of the fence. I call upon Mr. Sibson.

Mr. SIBSON (Bulawayo): Mr. President, Gentlemen, In 1937 there arrived in South Africa a gentleman who we have all come to know very well and in that same year this gentleman attended a Convention of the Association of Municipal Electricity Undertakings. Since that year he has attended every Convention that has taken place, and we are very glad indeed to see him with us here again today.

Major S. G. Redman has become for us almost a doyen of electrical engineers in this country, a genial friend whose guidance in all matters, not only in electrical matters I might add, has been of tremendous value to all of us, and he is one to whom we ourselves would consider it an honour to be permanently associated. For that reason, Mr. President, I do propose, with great pleasure indeed, that Maj. S. G. Redman should become an honorary member of this Association.

(Applause.)

Mr. KANE (Johannesburg): Mr. President, Ladies and Gentlemen. (Look at them all looking for the lady, she is up in the gallery). It gives me very great pleasure to second this very nice proposal. It is because of Major Redman that I introduced the lady just now. Mr. Sibson has told you of Major Redman's interest in this Association since 1937, but I think his interest in

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South Africa goes a lot further back than that. He represented his firm in the very early days in connection with the electrical traction in the Union, I think both in the Cape and in Natal, and although he has given you the impression that he has been proposed as an honorary member purely because of his good attendance, I think you will also agree with me that the real reason is the esteem and the affection in which we hold the Major and as we all know and for his very lovable ways at every convention. I have great pleasure in seconding the proposal. (Applause.)

THE PRESIDENT : It is obvious that the delegates here today agree with our final recommendation for honorary membership during this session of the Convention. I take it that is correct. (Applause.)

Would Major Redman like to reply?

MAJOR REDMAN (Johannesburg) : Mr. President and Gentlemen. I find it very difficult to thank properly the gentlemen who have proposed and seconded my admission to the very sacred number of men who have had their honorary membership to this association. I think my trouble is that I really cannot see how it is justified at all. Nevertheless, I am tremendously thankful, not only on behalf of myself, but also on behalf of my firm which for many years I have represented in this country and I have always received a kind invitation to go to the next one. I really and genuinely say I do appreciate the honour very much, and I shall be cocky about it to my firm, I am appreciative of being appointed, and I hope you will continue to invite me to your Conventions which are always a source of enjoyment and pleasure to me. Thank you (Applause.)

THE PRESIDENT : Thank you Maj. Redman, you do not have to worry about invitations. The Secretary would be on the carpet if one was not forwarded to an honorary member. Now I will ask Mr. Van der Walt to take the Chair.

Mr. VAN DER WALT (Krugersdorp) :

Ladies and Gentlemen, Mr. Mitchell, our President will now deliver his Presidential Address. (Applause.)

PRESIDENTIAL ADDRESS

by

J. E. MITCHELL (Salisbury).

ELECTRICITY IN THE FEDERATION OF RHODESIA AND NYASALAND

Before proceeding with my presidential address, may I say that I deeply appreciate the action of the Members of this Convention in electing me to the Presidency of this Association, the highest honour that can be bestowed on any municipal electrical engineer in Southern Africa.

That the municipal engineers and councillors in this Association, which comprises well over 90% from the Union of South Africa should so early in the life of this Federation have so honoured its capital city is, I feel, an earnest of the friendly relations that do, can be, and must be, sustained between our two countries.

There have been many in this chair before me whose eminence I will not try to approach, and there will be many to follow who will shine with much brighter light, but I can assure you that there has been, and will be none in the future who will, with your assistance and the assistance of the Executive Council, try harder to be worthy of this office.

I should, at this point, also like, on behalf of my own department, to extend a very cordial welcome, not only to the official delegates and their wives, but also to my many old friends among the distinguished representatives of Government Departments, other Institutions and last, but by no means least, our friends in the commercial fraternity.

The vogue in recent years for presidential addresses has been for them to be in the philosophical vein rather than to concentrate on anything technical, and to illustrate the part being played by municipal engineers and their undertakings in the lives of the people. I have welcomed such addresses because it has helped to bring from behind the bushel the light of understanding of the supply engineers' problems, the light which I maintain has been hidden

too long, because the engineer in the past has shrunk from blowing his own trumpet, and has been too busy to find anyone to blow it for him.

The developments which are taking place in electricity supplies in the new Federation in recent times have, however, been so startling that I hope I will be forgiven for departing, to a certain extent this year, from that precedent in order that I may give you an insight into what is happening in this country, in that field.

The four services most essential for a developing country such as this Federation are finance, water, communications and electricity, and as is natural in these circumstances, electricity is the one with which I am so vitally concerned.

Nothing has contributed more to the ever increasing standards of living of both the European and the African than electricity. What was only fifty years ago little more than an interesting science, with developments mainly in the lighting field, is today quite indispensable in every walk of life.

It is today taken for granted, and no one realises how recently electricity has become so invaluable in industry, commerce and the home. The major developments in the electrical field have all taken place in my own lifetime—and I do not consider myself old—and it never fails to amaze me how so many of my own contemporaries and personal friends, not a great deal older than myself, were almost pioneers in the electricity industry.

Anyone who has been an electricity supply engineer like myself for nearly thirty years has had the privilege of growing up with what must be one of the largest industries in the world today.

Only by greater output per man can the standards of living be improved, and only by greater usage of electricity, the most convenient form of energy, can an increase in production be gained.

Curiously enough the use of electricity has made it possible to extend the use of electricity, for without it mass production of so many home comforts, such as vacuum cleaners, washing machines, floor polishers and water heaters, might, in fact, be prohibitive, but their use improves the standards in the homes.

What, therefore, is this Federation doing about the provision of this most essential service? Perhaps a little history of the development of electricity in the various territories which constitute the Federation will be relevant at this juncture.

The Federation of Rhodesia and Nyasaland comprises Southern and Northern Rhodesia and Nyasaland with an overall area of 497,000 square miles, being larger in extent than the Union of South Africa.

In view of the prevailing rivalry that exists between Bulawayo and Salisbury, it is a little hard for me to recount that the first public supply of electricity was established in Bulawayo in 1897. This was started by Willoughby's Consolidated Co. Ltd., a concern which obtained the concession originally granted in 1895 to three pioneers entitling them to the monopoly of providing Bulawayo with its public electricity and water requirements. In 1897, when the first train entered Bulawayo, electric light was available. All the original equipment had been transported from Kimberley by ox wagon. Another noteworthy feature was that the first plant consisted of a 75 kW. single-phase alternator generating at 2,300 volts and at 125 cycles per second, driven by a reciprocating steam engine, and thus Bulawayo started with alternating current only twelve years after it was first introduced into London. The plant capacity had increased by 1924, when the municipality took over the undertaking, to a total capacity of 625 kW. and the frequency had been changed to 50 cycles per second.

During the first ten years of municipal ownership the output increased thirteen-fold, the maximum demand increased ten-fold, and the average price per kWh. was reduced to one-fifth. The total energy sold in the last of these years was twelve million kWh.

By 1945 the capacity of this main station had increased to 28.5 mW. and the winter peak for that year was 18.2 mW. It was at that time that plans were made for the new Thirteenth Avenue power station, to have an ultimate capacity of 120 mW. and to operate at 600 lb./sq. in. and 850°F. The first installation of one 15 mW. machine and associated boilers was officially opened

in November 1948, and a second 15 mW. set was installed in April, 1952.

Two 30 mW. turbo-alternators and associated boilers have been installed and commissioned since that date, and the last 30 mW. machine to complete the station is now being erected.

As Salisbury is the subject of a paper to be given at this Convention, I will not give any description of the growth of this City, and pass to the Rhodesian Electricity Supply Commission, which commenced operations in 1936, when supply was first purchased from the Salisbury Municipality and sold to a mining area to the north of that City. Under the terms of the statute under which the Commission operates, it acquired the generating stations of certain smaller municipalities such as Umтали, with a capacity now of 15 mW., and Gwelo (4.5mW) and at the same time built its own station of 5 mW. in the Midlands area at Umniati. The capacity of this central station at Umniati has now been increased to 100 mW. and is to be further increased to 120 mW. At the same time the station supplying the large asbestos mines at Shabani has been enlarged to over 30 mW.

The development of the Rhodesian Electricity Supply Commission has been rapid indeed, its total output last year being over 500 million kWh. The Commission has been responsible for the development of electricity supply over practically the whole of Southern Rhodesia, apart from the two main cities, in such a manner that overseas visitors remark that, despite the size of the area, there appear to be fewer farms or industrial concerns without electricity supply than anywhere else in the world.

In Northern Rhodesia municipal supplies are confined to the towns of Lusaka and Ndola, both of which undertakings have extensive developments in hand. Ndola is increasing its plant by 10 mW., while Lusaka, which seems to be having great difficulty in meeting the demands made upon it, and has recently changed ownership to a private company, is also extending by a similar amount.

The main centres of generation in Northern Rhodesia are, of course, the copper mines, which are linked through a grid operated by the Rhodesia Congo

Border Power Corporation. The electricity consumption of the territory has risen in less than forty years from practically nothing to over 1,000 million kWh. per annum. In the early 1920's the only large-scale consumer of power in Northern Rhodesia was the Broken Hill mine, near which, at Mulungushi, an existing natural dam site was capable of impounding a quantity of water above the gorge where a hydro-electric power station was developed and opened by the then Prince of Wales during his tour of the territory in 1925. The 22 mW. capacity of this station sufficed until 1944, when it was extended by the construction of a seasonal flow station at Lusemfwā, some thirty miles farther away.

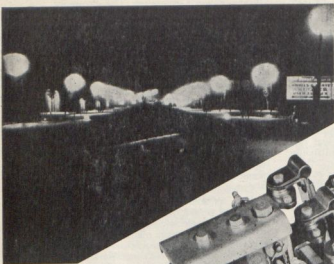
Developments on the Copperbelt have led to considerable expansion in the demand for power, which could not be met by the hydro-electric stations near Broken Hill, and steam power plants were built at each of the four mines, 'Nkana, Mfulira, Roan Antelope and 'Nchanga, the installed capacities of these stations in 1940 totalling about 90 mW.

In order to pool the resources of the four copper mine power stations it was agreed in 1948 to interconnect these undertakings by means of a 66kV. transmission line network under the ownership and control of the Northern Rhodesia Power Corporation Limited. The present combined load of the copper mines is of the order of 120mW., and fairly reliable estimates indicate that by 1960 it will have risen to a figure of over 220mW.

It is programmed to commission very shortly some 300 odd miles of 220 kV. line between the Copperbelt and the Belgian Congo through which, for a contracted period of years, the copper mines will be able to import up to 50 mW., of demand, and this, it is thought, will obviate the necessity for further installations of thermal power plant in that area until such time as hydro-electric power from other sources is available.

In respect of Nyasaland, it is interesting to note that one of the first public electricity supplies in Central Africa was commenced at Zomba in 1902, when the initial plant comprised a small Gilkes Pelton wheel coupled to a d.c. generator which supplied the new Government House and

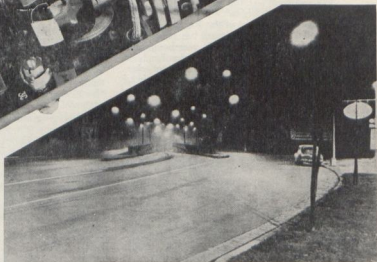
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the houses and offices which then comprised the Protectorate capital. The present plant consists of only two Pelton wheels fed from a stream 300 ft. up on the slopes of the Zomba Mountain and a 500 kW. diesel plant. This, it is understood, is shortly to be augmented by two further 300 kW. Pelton wheel turbo-alternators.

Public supply was commenced in Blantyre in 1926, and it has since been acquired by the Government, while in Limbe, the Nyasaland Railways made available the necessary bulk supply to the Town Council and this supply also has been since taken over by the Government. Great developments are, however, expected in Limbe and Blantyre—adjacent towns with a common boundary—and the Government is providing a 10mW. steam power station to serve them and the surrounding district.

The Government has also agreed to make a start on the Shire Valley scheme which, although it has as its main object the control of the level of Lake Nyasa, is purported to have a potential of 100 mW.

What has caught the imagination of the whole world, however, is of course the new Kariba scheme, which has a maximum output of 1,200 mW., and this it is expected, even keeping the present thermal power stations in use, will be fully committed by 1972.

Delegates will know, of course, of the controversy which has raged between Northern and Southern Rhodesia in regard to Kariba versus Kafue, but there seems every likelihood that if the prognostications of load up to 1972 are correct, then it would appear most probable that a start will have to be made on the Kafue scheme as well, some years before that date in order that the potential of that scheme can also come into operation, and it is expected that this will, in effect, double the hydro-electric capacity of the Federation.

I mentioned earlier on that the actual area of the Federation was greater than that of the Union of South Africa, and it is therefore quite startling to realise that almost the most northerly point of the Federation, the Copperbelt, and one very far in the south, namely Bulawayo, will, in fact, be linked through Kariba, Umnati and Salisbury by a 330 kV. grid, and this gives rise to the thought that it may not

be far distant when the major power stations of the Union of South Africa will be similarly linked, and save considerable costs in rail transport of coal from the coal mines to the coast.

What I have told you in regard to the municipalities was correct up to this year, but with the prospect of cheap supplies of power from the Kariba hydro-electric scheme, it became obvious that no longer could each undertaking continue to work as an isolated unit, nor could each territory.

Also as electricity was one of the subjects on which both the Federal and Territorial Houses could legislate, it was necessary to bring in new legislation which could cater for these changes.

The first major change will be to create a Federal Electricity Power Board, whose functions will be to construct and operate the Kariba power station, the 330,000 volt grid linking Kariba with the present main generating authorities, and the control of generation, whether it be produced from thermal or hydro sources, so as to produce the overall lowest price of power.

The second major change is to create Territorial Supply Commissions, one for each territory, whose functions will be exactly similar to those of the original Southern Rhodesian Electricity Supply Commission except that they will gradually cease to be generating authorities, although for the time being they will operate their existing power stations under the orders of the Federal Electricity Power Board.

The third change is to create Electricity Councils, one for each territory, whose functions will be to advise the Minister on all matters in regard to licensing and tariffs, in the same way as the old Electricity Control Board operated.

The existing municipalities will continue to operate exactly as before except that, once they are connected to the 330,000 volt transmission system of the Federal Electricity Power Board, they will have to operate their power stations under orders. Their licences for supplying outside their own municipal areas are to be automatically renewed.

When this "pooling" arrangement is working, a system very similar to the old Central Electricity Board arrangement in

the United Kingdom will have been put into commission, but to my mind there will be one very vital difference.

Under the Central Electricity Board arrangement there was a distinct incentive to run one's own individual plant at the highest efficiency because, by a certain clause, the department's re-purchase price was reduced accordingly. Also a meeting of all power station superintendents in an area was called once a quarter, when all figures of efficiency, maintenance costs, etc., were examined for one power station in relation to another. The coal cost included in the final "pooled" figure is so small in comparison to the remainder that the incentive for high thermal efficiency, under the arrangement as envisaged by this new Federal legislation, could be lost, and there could even be an incentive for the Municipal undertaking to endeavour to be paid as much as possible for the electricity generated so as to carry out the most expensive maintenance programme in order that its plant, which still remains the undertaker's asset, will have the highest resale value. It is hoped, however, that by goodwill on all sides such an eventuality will not materialise.

When analysing the costs of running an electricity undertaking the savings that can be made in administration and distribution costs are very limited, but considerable savings to the undertaking can be made in both the design and the operation of a power station. If a bonus, for instance, were to be offered for coal used at a power station, it is surprising what a difference this could make, but it would be difficult to find a similar incentive to offer to a staff of a purely distribution undertaking.

Without any disrespect to the South African Electricity Supply Commission, who I feel are possibly one of the most efficient generating undertakings in the world, ask any of those undertakings who are supplied in bulk by that Authority what has been the main cause for their tariff increases in recent years, and I am sure they will tell you that it is the price of bulk power.

There is no doubt that the authority that controls generation controls almost entirely the cost of a unit to the consumer.

Consequently, and again with no disrespect of those who have not had the opportunity of running their own power station, I say that for those who have, a considerable amount of the zest for efficiency and a cheap unit of electricity, must die with the introduction of this scheme.

You will appreciate, however, that the country is well on the road to obtaining all that is necessary for the provision of an ample and reasonably cheap supply of electrical power.

There is one field, however, where the Federation is far behind the rest of the world, even though the rest of the world has only just come to grips with the problem itself, and that is in technical education.

Despite the fact that this subject has been raised at practically every A.M.E.U. Convention in the last few years, I make no excuse for raising it again, not only because it is one of our vital problems, but also because the position in the Federation is so much different from that in South Africa.

The Government of this country gives first priority to general education up to Higher Certificate standard, and obviously no one can disagree with that priority.

There seems to be, however, rather a lack of awareness of the serious situation in regard to technical education, especially in regard to electrical engineers.

I wonder if it is generally realised that no matter how brilliant a student or a pupil engineer may be, he cannot sit his examinations in this country to become a Chartered Electrical Engineer. None of the technical institutions in the Federation are recognised by the Institute of Electrical Engineers as being of sufficient standing to be accepted for more than a College of Preparation for Part 1. Parts 2 and 3 must be studied for out of the country.

Now, that may be thought to a certain extent to be a good thing because of the added experience gained, but the drawback is that there is such a shortage of trained engineers in the power industry, that these young men who go overseas for their training are made such attractive offers not to return that they are lost to the country for good.

The reason for this situation is that both the Bulawayo Technical College and the Salisbury Polytechnic have neither the laboratory facilities nor the staff to allow either institution to qualify as a College of Preparation at the higher level. May I say here and now that this is no reflection whatsoever on the present staff of both institutions, who have done a most arduous and sterling job of work, and have obtained most startling results, but it is an indictment of the system for recruiting technical lecturers, who are not allowed to be appointed further up the scale of salary than allows for four years' experience. What a limited choice we should have at the new University here in Salisbury if we had only been allowed to pay the scale for professors equivalent to a teacher only four years out of college.

It is also recognised that the new Part 3 examination for the Institution of Electrical Engineers is practically University standard, and to my mind the only way to make it possible for local students to obtain this standard, and it is a very necessary standard in a country which is going for electrification on the scale envisaged, is by the setting up of a "sandwich" course, where students work full time at the college for six months of the year, and six months with their employers for the other half.

This would of course mean hostel accommodation, but it is vital if sufficient engineers and technicians are to be provided to make use of the hydro-electric schemes in view. The number applying for power engineering posts all over the world is becoming fewer and fewer, and it will not be long before the Federation will have to stand on its own feet and provide its own engineers from its own senior school boys.

When one considers that the Federation will, during the next six years, not only spend £80,000,000 on the Kariba scheme, but very nearly another £20,000,000 in distributing that power to the users, the amount required to provide its own engineers with proper training facilities is very small.

With the greatest respect to the Minister of Education and his officials, I suggest that the majority have been too steeped in ordinary school education, or possibly too

overworked, to appreciate what is required for technical education. There is in this country a local Rhodesian Institution of Engineers, representing all branches of engineering vital to the Federation's development, and a close liaison between that body and the Education Department would, I feel sure, help both those bodies to appreciate the difficulties of the other.

One last, and possibly personal effect of the new development in the electricity supply in the Federation is that the major Municipalities of Bulawayo and Salisbury lose a certain part of the autonomy which they have held for their electricity supply undertakings for so many years. Municipal electrical engineers who have had control of every facet of electricity supply, including administration, sales, financial control, generation, distribution, and installation are a dying race, and only as far as I am aware existed (after the nationalisation of the electricity industry in the United Kingdom) in the Union of South Africa and the Rhodesias. With the advent of the new legislation, despite the fact that Bulawayo and Salisbury will be responsible for the operation of their power stations, they will no longer have what to my mind was the real spice and interest in their work, namely the design and the expansion of new power stations.

This is possibly rather a sad note on which to end a presidential address, but with the tremendous developments in the electrical field throughout Southern Africa I am sure that the efforts and co-operation of all municipal electricity undertakings will be necessary and vital to their successful outcome.

Mr. VAN DER WALT (Krugersdorp):

Thank you for that very informative address, Mr. President, I will now call upon Mr. Kane from Johannesburg to propose a vote of thanks.

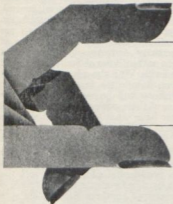
Mr. KANE (Johannesburg): Mr. President, I think it is safer here. I will tell you why in a moment.

Mr. President, Ladies and Gentlemen, first of all I would like to follow in the footsteps of our immediate Past President in congratulating you on taking office with the Association, and I hope, I am sure, you will have a very happy and successful year

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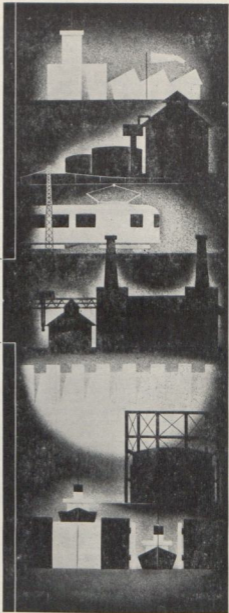
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of office. In proposing a vote of thanks, I think a person is in somewhat the same position as the President was in choosing his subject and attitude in giving an address. In a vote of thanks you have got to be so very careful that you do not discuss his paper or his subject. You do not perhaps tell him how or where he is wrong, and, incidentally give the impression that you could do it better yourself (which of course, is entirely wrong) and it is very difficult merely to say thanks.

I can appreciate your difficulty in your following your predecessors. In this particular case I think you have very good reason for tending, as you said, to deal with more technical subjects. In fact you have in effect taken us through the history of electrical supply in the Federation, you have discussed the future developments of electricity supplies, you have also gone on to the subject of shortage of personnel, technicians, technologists, and, of course, you have discussed the two commissions in the country and referred to the new legislation which you appear to think will improve the situation.

I think I am correct, or would be failing in my duty if I just criticised you in one aspect. You naturally, and I can understand why, were very diffident in referring to Bulawayo; you were very guarded in any reference to your capital city; you gave a reason why, which we all appreciate, but I am disappointed that you, in your own "Jimmy-Mitchell-way" did not enlarge a little bit more on the subject of Salisbury.

I would like to tell you that I took the opportunity, yesterday, of wandering round the town for a short while. Now yesterday was Sunday, and it is surprising to see how much work, building work, excavation work, and other types of work, and even municipal work in the Parks, was going on there. I rather gathered that the rapid development that has been common in other parts of the country is really getting out of hand here. In fact it shook me to see some of the building work that was going on, even on a Sunday.

I think the wages here are fairly high. I presume that there is at least a double shift. I mentioned Salisbury, and the

President has not; I am just wondering if it would be wise at this stage to refer to one aspect: I very much doubt if Salisbury has a traffic department. I don't know if it comes under Jimmie or whether it comes under the City Engineer or some other person. The President: (Alderman Morton Jaffray). Well, all the more reason. I was going to make a suggestion that in Stanley Avenue, I think it is Stanley Avenue, a nice avenue, there are many robots that work very efficiently, no doubt maintained by Jimmy's department. But there never seems to be any heed taken of these robots. For those people who only arrived yesterday I hope you did not think that this morning's din starting at a quarter past six was really a welcome to you, good people, apparently it happens every morning starting at a quarter past six and every quarter hour thereafter. These aeroplanes come up Stanley Avenue and just simply ignore those robots. (Laughter.)

I did say when I got up here that I would refer to this particular position, it's nothing to do with your address, but I think we were all amazed this morning at the thought that was given to the preparation in the taking of the photograph. That idea of plaques and the numbers really saves a lot of time and trouble, and I am just wondering if the same mind that had that thought has also decided that the principle people speaking on these functions should come up here and sit right under a very heavy safety screen. I am just wondering if Jimmy is going to adopt the guillotine occasionally.

Mr. President, I have very great pleasure in thanking you on behalf of the delegates for a very interesting paper, and address. You have covered many subjects of interest, I am sure you have to a certain extent taken an unfair advantage because you know quite a few members of the audience will not be permitted officially to discuss your address, but definitely it is very thought provoking, and I take this opportunity of thanking you and formally proposing a vote of thanks.

Mr. VAN DER WALT (Krugersdorp): Thank you, Mr. Kane, for not criticising Mr. Mitchell's paper (Laughter.) I will now call upon Mr. Boneschans to second that vote of thanks.

Mr. BONESCHANS (Germiston): Mr. President, Ladies, and Gentlemen, it gives me great pleasure to second the vote of thanks proposed by Mr. Kane on the Presidential Address of Mr. Mitchell, the bright City Electrical Engineer of Salisbury. I am glad that Mr. Kane has dealt with one side of the address and it leaves me to deal with the general aspect. I was fortunate in getting a copy of the Presidential Address, and in reading it I was impressed by the way it was set out, and I wonder whether that could be the reason why it was all the more interesting.

It struck me that the President went about his address as a Councillor, Politician, or Statesman would go about his speech after being elected to office, or even before. He remarks on the honour bestowed on him, gives credit to his predecessors, extends a warm welcome to his supporters, gives an indication of his policy, remarks on friendly relations with two neighbouring countries, sketches out what is actually going on behind the scenes, gives the overall area of land affected by the issue, remarks on the existing rivalry, digs into the history, gives a glimpse of the future with its vast possibilities, makes suggestion regarding the correct approaches, remarks on educational facilities, makes a strong appeal for co-operation, and lastly, to prove his sincerity, he hands to a good neighbour in the strictest confidence a copy of his speech. (Laughter.)

To substantiate in a way what I have just said, I would like to read to you two paragraphs of the President's speech and then re-read with the substitution of only two or three words very much liked by the politicians in the Union, and possibly in the Federation. If at the end you are not too severely shocked, you will appreciate that the President, like a true President, is well acquainted with the frame work. Now I am reading paragraph 2, page 2.

Mr. Mitchell says: "Nothing has contributed more to the ever increasing standards of living of both the European and the African than electricity. What was only fifty years ago little more than an interesting science, with developments mainly in the lighting field, is today quite indispensable in every walk of life."

Now the South African politician would read it like this: "Nothing has contributed more to the ever increasing standards of living of both the European and the African than *apartheid*. What was only fifty years ago little more than an interesting science, with developments mainly in the *social and political* field, is today quite indispensable in every walk of life."

Now on that same page, paragraph 3, Mr. Mitchell says: "It is today taken for granted, and no one realises how recently electricity has become so invaluable in industry, commerce and the home. The major developments in the electrical field have all taken place in my own lifetime—and I do not consider myself old—and it never fails to amaze me how so many of my own contemporaries and personal friends, not a great deal older than myself, were almost pioneers in the electricity industry."

Now perhaps the Federation politician would read it like this: "It is today taken for granted, and no one realises how recently *Partnership* has become so invaluable in industry, commerce and the home. The major developments in the field of *partnership* have all taken place in my own lifetime—and I do not consider myself old—and it never fails to amaze me how so many of my own contemporaries and personal friends, not a great deal older than myself, were almost pioneers *with the policy of partnership*." (Laughter and Applause.)

I won't go any further Mr. President, I only wanted my fellow councillors to appreciate the similarity in set-up. I wish my previous remarks not to be taken too seriously, but I am very sincere when I now say, Mr. President, that I want to congratulate you on your very sincere and illuminating and interesting address. To me the developments in the Federation, particularly in the electrical field has been a real eye-opener, the fact that I am convinced of is that the Federation has in Salisbury in the person of Mr. Mitchell a very able and efficient all-round man of good calibre and with a broad view to assist in solving so many of your present and future problems regarding the supply of electricity. May God bless you in all

your efforts, and permit you to ascend to very great heights. May you be granted good health to fulfill the many arduous duties which come with the high office you now hold. We are confident that the affairs of the Association are in good and stable hands. Allow me now, Mr. President, to say a few words in Afrikaans.

Meneer die President, Dames en Here. As ons dink aan die lig en krag dan dink ons aan die eerste instansie aan die een wat ligte in die Rhodesië gebring het baie jare gelede, en die lig waar na ek nou verwys, is die lig van skrif. Ek dink hieraan en besonder en as bron van krag na hierdie land gekom het. Op sy voete het later gevolg die verskillende dorpe wat toe gestig is, en toe het daar ook laas onder weg lig gekom. Toe kom daar elektriese lig en elektriese krag. Nou het ons geleer en geluister na Meneer Mitchell se mooi toespraak waarin hy ons uiteensit hoe wonderlik die ontwikkeling hier is in die bepaalde rigting. As ek dink aan daardie verbaasende skeme, die Kariba skeme, dan is ek oortuig daarvan dat daardie krag genoeg is vir die hele Federasie. Maar ek glo en ek is seker dat daar sal gesorg word dat die kragstasies sal staan te bly wat hulle vandag het op die verskillende en in die verskillende stede is sodat in tye van internasionale komplikasies, daardie kragstasies op die byde hand sal wees om nodige krag teverskaf. Ek will dit net sê dat as die lig van beskawing gekom het, dan moet daardie lig van die beskawing ook beskerm word. So sal dit nodig wees om die nodige verdediging almeer en meer sterker te maak Soos die lig van die beskawing geeslik so wel as met hierdie heel na staan te bly in Rhodesië, en nog eens Mr. Mitchell ek wil u geluk wens met u mooi uitstekende toespraak, en ek wil u God se rykste seën toebid. Dankie. (Applause.)

Mr. VAN DER WALT (Krugersdorp): Thank you very much Mr. Boneschans, now will you all show your appreciation of Mr. Mitchell's address in the usual way. (Applause.)

THE PRESIDENT: Thank you very much, both delegates, proposer and seconder. We will now adjourn for tea.

3.30 p.m.—Refreshment Interval

3.45 p.m.—Convention Resumes.

THE PRESIDENT: I will now call upon the Secretary to read the Annual Report.

ANNUAL REPORT OF THE SECRETARIES

To the President and Members of the Association.

Mr. President, Gentlemen,

It gives me great pleasure to submit to you the Annual Report together with the Revenue and Expenditure Account and Balance Sheet for the financial year ended 29th February, 1956.

OBITUARY

I regret to have to record the passing of Mr. L. L. Horrell, a past President and also Secretary/Treasurer of the Association.

TWENTY-NINTH CONVENTION

The Twenty-Ninth Convention of the Association was held in Pretoria from Tuesday, 3rd May, to Friday, 6th May, 1955. The delegates were welcomed to Pretoria by His Worship the Mayor, Councillor H. Muller and the Convention was formally opened by Dr. F. J. de Villiers, Chairman of the Electricity Control Board.

A total of 386 members, delegates, representatives, visitors and ladies attended the Convention.

On behalf of the President, Members of the Association and others who were privileged to share in the outstanding hospitality of Pretoria, I wish to take this opportunity of expressing sincere appreciation to His Worship the Mayor and the City Council of Pretoria for the entertainment and facilities provided. The ladies were most appreciative of the arrangements made for them, and lastly our sincere thanks go to those Officials of the Pretoria City Council who contributed so much to the success of the Convention.

Alternative visits were arranged to the Bureau of Standards and the works of A.S.E.A. Electric S.A. (Pty.) Ltd. Our sincere thanks are conveyed to those responsible for the most interesting time had by the visitors.

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Papers presented at the Convention were by Mr. R. S. Dunstan, B.Sc. (Eng.) (Rand), M.I.E.E. on "Rural Distribution of Electricity by the Pretoria Electricity Undertaking" and Mr. O. D. Gorven, B.Com., A.I.M.T.A. (S.A.), A.C.I.S., on "Depreciation and Renewals Funds". Both papers proved most interesting and valuable discussion thereon took place.

The Engineers' Forum was again a highlight of the Convention.

An invitation from the City Council of Salisbury to hold the Thirtieth Convention in that city was unanimously accepted.

MEMBERSHIP

The following new Members were elected during the year ended 29th February, 1956:—

Council Members:

Municipality of Witbank.
Municipality of Warmbaths.

Engineer Members:

E. T. de Villiers, Witbank.
M. P. P. Clark, Somerset East.
F. J. van der Merwe, Ladybrand.
T. P. Schroeder, Adelaide.
D. M. Nobbs, Port Elizabeth.
P. J. Vorster, Potgietersrus.

Honorary Members:

Mr. J. C. Fraser.
Mr. W. Bellad-Ellis.

The comparative figures of Membership for the years 1953/4 and 1954/5 are:—

	1954/55	1955/56
Councils	108	110
Engineer Members	102	108
Honorary Members	5	6
Associates	32	32

Honorary Legal Adviser:

It is with pleasure that the appointment of Mr. A. P. Burger as Honorary Legal Adviser to the Association is recorded.

FINANCE

I do not propose to read to you the details of the Income and Expenditure Account and Balance Sheet, but wish to refer to the salient points.

The year under review is the first one completed in which the new arrangements

in regard to the financial contribution of Companies represented at Conventions and the financing of certain Convention Expenses have applied. It is accordingly too early to assess accurately the effect which this additional income and expenditure will have on the finances of the Association when averaged out over a number of years. Furthermore, advertising income appears to be related to some extent to other contributions from the Commercial community, but here again to what extent remains to be seen.

Turning now to detail, the Revenue and Expenditure Account for the year reflects an Excess of Expenditure over Income of £27 4s. 0d. This has been transferred to Accumulated Funds, which now stands at £3,283 8s. 6d. Whilst the overall position is satisfactory, the narrow margin between Income and Expenditure reflected this year has been the subject of most careful consideration by the Finance Sub-Committee. Its recommendations have been conveyed to the Executive Council. I take this opportunity of thanking Messrs. R. W. Kane and J. C. Downey for their assistance as Members of the Finance Sub-Committee.

On behalf of the Association, I wish to thank all those responsible for its financial support for their continued interest.

GENERAL

At the conclusion of my first year of association with A.M.E.U., I take this opportunity of thanking you, Mr. President, and the Members of the Executive Council, for your courtesy and assistance at all times. Seldom have I or my firm been privileged to conduct the affairs of a body where such co-operation has been possible and we hope that we may have the pleasure of continuing to serve the Association for many years to come.

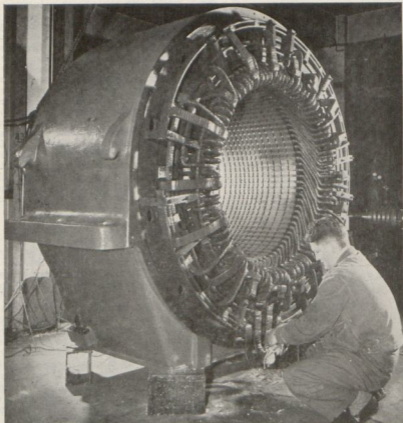
Lastly, I wish to place on record our appreciation of the co-operation of Mr. A. T. Taylor in handing over the affairs of the Association to ourselves. He asked me to convey his best wishes to his friends at this Convention.

R. G. EWING.

for ARTHUR TINCEY, EWING & CO.,
Secretaries.

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ELECTRICAL WIREMEN'S
REGISTRATION BOARD

Mr. President and Gentlemen,

Once again we are indebted to the Chairman of the Board, Mr. R. N. F. Smit, (Chief Inspector of Factories), for the detailed record of the activities of the Board for the calendar year of 1955 and the information supplied will be printed in full in the proceedings of the Convention.

There are several matters, however, that should be brought to your attention.

Returns in terms of Section 17(2) of the Act.

My predecessor, at the Pretoria Convention last year, drew attention to the fact that the wireman has to notify the Department of Labour annually of his continued activities or otherwise and he also requested the engineers present to assist in this matter if at all possible. The number of returns during 1955 was 26.5% compared with 24.7% for 1954, an improvement of 1.8%; however, the increase in registration certificates issued over the same period is 5.9% and it is, therefore, extremely doubtful whether any material improvement has been effected. Once again, assistance from engineers will be appreciated.

Determination of Areas.

Notice of intended determination was issued during 1955 to five areas, but this gives no indication of the activities of the Board in this connection. During 1954 a notice was issued concerning approximately 40 areas and approval was obtained from the local authorities concerned. However, the Department reported that considerable opposition was received on the basis of the possible affect on the areas and existing wiremen. Whereas in the past the Board considered determination on the basis of total population, it was decided during 1955 to approach all areas concerned to determine the number of contractors, registered and non-registered wiremen, number of consumers, area of supply, electricity consumption, source of supply and whether the magisterial or Municipal area should be determined.

On the receipt of this information a special meeting was held and 54 areas were considered and in practically all cases it

was recommended that the Minister should proceed with determination, although extended periods of warning were suggested.

Amendments to the Act.

During 1955, the Act was amended to make provision for persons trained in accordance with the Training of Artisans Act, 1951, to do wiring work on the same condition applicable to apprentices. In addition, members will recollect that the Board, in 1953, approached various bodies regarding amendments and this Association accepted definite proposals that had been submitted in 1953 to the Board. The Unions and Contractors had somewhat different views on this subject and no definite action has been taken by the Board.

During 1955, it was obvious that the implications of the revised Apprenticeship Act would create further difficulties in the application of the Wireman's Act and in October, 1955, an endeavour was made to reach some finality in this matter. Following this, the Unions engaged an industrial consultant to consider the amendments and as no apparent progress had been made, it was decided by the Board in April, 1956, that an early special meeting would be convened to prepare a report on the amendments considered necessary for submission to the Minister with a view to these being available for any convenient Parliamentary session.

Materials for Practical Examinations.

Members will appreciate that a fair amount of material used in the practical examination is not expendable, whilst other types of material are partly or wholly expendable. In the past all material has been supplied by the Public Works Department and difficulties, because of financial control, have arisen over the return of material.

Consideration has been given to this problem and thanks to the Chairman and other members of the Board, who are members of the Labour Department, a solution has been found and a new system introduced wherein the various examination bodies, mostly Technical Schools, retain all stocks and merely order the expendable material as and when required.

Natives.

According to records, two Natives in the past have applied to sit the examinations, but have proved unsuccessful. During 1955 a further two applications were considered and arrangements were made during this year for the necessary examinations. One candidate was successful and it is considered that the other candidate should be successful in his next attempt.

Persons Authorised to demand Certificates of Registration in terms of Sections 15(1) and 17(1) of the Act.

Towards the latter part of 1955 all Inspectors of Factories (Engineering) were authorized to inspect "wiring work", but a Departmental instruction was issued to the effect that the inspector should not undertake this work unless specifically requested in writing by the Supply Authority to do so and then only in special instances and in company with the supply authorities representative or in connection with an accident. Inspectors are, however, free to demand proof of registration from persons doing wiring work and take affidavits where necessary.

Personal.

I would like to take this opportunity of thanking the Association for their action in submitting my name for representation on the Board and to state that the experience gained has been most interesting and valuable.

ANNUAL REPORT, 1955.

Membership and Meetings of the Board.

The Board for the year 1955 was as follows:—

Chairman: Mr. R. N. F. Smit, Chief Inspector of Factories.

Members: Messrs. R. W. Kane, J. M. Fraser, T. D. Bowness, R. Yeoman and A. Barbour.

The Board held eleven ordinary meetings and one special meeting and the Examinations Sub-Committee met on seven occasions during the year.

Applications for Registration.

Reference to Table I. shows that of the 502 applications received during the year, the Board approved of the issue of certificates of registration in seven instances

without examination, these being exceptional cases in which exemption from the prescribed examination was considered by the Board to be justified.

Of the remainder, 467 were accepted for the full examination, 16 applications were rejected on the grounds of insufficient training and experience in wiring work, whilst in 12 cases the Board deferred its decision pending further information in respect of the applicants.

Figures covering the past 15 years of the Board's activities are given for comparative purposes.

Table II. reflects the number of registration certificates issued and the conditions under which they were granted:

It will be seen that, up to the end of 1955, exemption from examination had been granted in 2,409 cases, the majority of these exemptions having been issued to applicants who, at the inception of the Act, already held licences issued by suppliers and were thus entitled to registration in terms of Section 12(1) (e) of the Act. The remainder of the 6,152 registered wiremen, i.e., 3,743, had passed the Board's examination.

Examinations.

The Board has the power to exempt candidates from certain parts or sections of its examinations on proof of their having passed some equivalent examination or test and in Table III. is given an analysis concerning the cases of the 3,743 persons who have so far succeeded in qualifying.

From this table it will be seen that only 68.4% of the candidates who succeeded in passing Section I. of the examination do so at the first attempt and 68.2% who succeed in passing Section II. do so the first time. With regard to Part B the practical examination, the pass list is somewhat higher, only 6.3% of the candidates having to make more than one attempt.

Figures relative to the 1956 examination are given in Table IV.

Four written examinations, i.e., Section I. and II., were held and only 25.7% of the candidates were successful.

The results of the practical examinations were somewhat better, 85.7% of the candidates at the 10 examinations having passed.

At the beginning of the year eight practical examinations were scheduled but it was later found to be necessary to hold two additional examinations at Johannesburg and Cape Town. It is not possible, due to lack of suitable accommodation, to examine more than a certain number of candidates at one time. Due to this fact a backlog of entrants had accumulated at the two centres mentioned above and this had to be disposed of.

Returns in Terms of Section 17(2).

Every holder of a certificate of registration must in terms of Section 17(2) of the Act, give notice not later than the 31st March of each year of his residential address and whether he continues to practice as a wireman.

Failure to comply with this Section is a punishable offence but, in spite of this, only 1,538 out of a total of 5,799 registered wiremen (or 26.5%) had up to the end of 1955 rendered a return of this information.

Determination of Areas.

In terms of Section 18 of the Act, notices were published in the Government Gazette

of the Minister's intention to determine the following areas after the expiry of one year from the date of publication:—

The Magisterial Districts of Lower Tugela and Wolmaransstad.

The Municipal Areas of Hennenman, Ventersburg, Virginia and Wolsley.

Prosecutions.

During the year there were five prosecutions in connection with offences under the Act.

Two of these were in connection with the performance of illegal wiring work, i.e., re doing wiring work in a determined area, by persons not in possession of a certificate of registration; two were in connection with the performance of wiring work by improvers, apprentices or minors (other than apprentices) not under continuous supervision and the fifth was in connection with the putting into operation of wiring work without the knowledge of the supplier. In all cases fines were imposed.

TABLE I.
APPLICATIONS FOR REGISTRATION

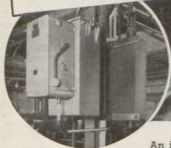
Year	Number of Applications considered	DECISIONS OF THE BOARD			
		Exempted from Examinations	Accepted for Examination	Refused	Deferred pending Receipt of Further Data
1940	3,540		898	400	
to					
1944					
1945		2,403			248
to					
1949	3,089		2,337	329	
1950	460		338	122	
1951	372		349	37	
1952	509	27	417	43	22
1953	458	20	387	17	34
1954	618	4	550	18	46
1955	502*	7	467	16	12
	9,548	2,461	5,743	982	362

*Including 21 in respect of which decision had been deferred during previous years.

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TABLE II.
REGISTRATION CERTIFICATES

Year	Registration Approved Applicants having been Exempted from Examination	Registration Approved after Applicants had Passed the Prescribed Examination	Total		
1940-1944	2,351	2,507	2,084		
1945-1949			2,059		
1950			433		
1951			282		
1952			27	256	283
1953			20	313	333
1954			4	321	325
1955	7	346	353		
	2,409	3,743	6,152		

TABLE III.
ANALYSIS OF 3,743 CANDIDATES WHO HAVE BEEN SUCCESSFUL IN THE EXAMINATIONS

Sections of Examination which Candidates were Required to do so	Number	Section I. 3,121 Candidates						Section II. 2,279 Candidates						Part B. 3,360 Candidates			
		Successful after						Successful after						Successful after			
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4
Full Examination—i.e. Sections I. and II.	2,187	1,465	432	169	68	26	27	1,494	405	159	73	26	30	2,053	128	6	—
Section I. and Part B	551	401	112	23	9	2	4	—	—	—	—	—	—	523	25	2	1
Part B only	622	—	—	—	—	—	—	—	—	—	—	—	—	574	45	2	1
Section I. only	291	211	68	4	3	3	2	—	—	—	—	—	—	—	—	—	—
Sections I. and II. only	92	59	19	6	3	4	1	62	17	9	1	2	1	—	—	—	—
TOTALS	3,743	2,136	631	202	83	35	34	1,596	422	168	74	28	31	3,150	198	10	2

TABLE IV.
(A) WRITTEN EXAMINATIONS, 1955

Number of Notifications issued	2,110
Number of entrants	849
Number of entrants who failed to attend	95
Number of candidates who wrote the examinations	754

SUMMARY OF RESULTS

Section(s) of Examination which candidates were required to write	Number of Candidates	Number of Candidates who Passed			Failed
		Sections I. and II.	Section I.	Section II.	
Sections I. and II.	393	79	28	90	196
Section I.	339	—	98	—	241
Section II.	22	—	—	17	5
TOTAL	754	79	126	107	442

Number of candidates who by passing the written examination became eligible for the practical examination or (if exempted therefrom) for registration	194 (25·7%)
Number of candidates who failed in one or both sections of the written examination, and were required to re-write—	
Sections I. and II.	196)
Section I.	329} 560 (74·3%)
Section II.	35]

(B) PRACTICAL EXAMINATIONS, 1955

No. of Examinations Held	Number of Entrants	Number of Successful Candidates
10	413	354 (85·7%)

THE PRESIDENT: Yes, Mr. Smit?

Mr. SMIT (Johannesburg): Mr. President and Gentlemen, I am glad to have this opportunity of saying a few words on the work of the Board during 1955. They had a very difficult task in some cases, and to decide whether certain candidates should be allowed to enter. This was not made any easier by the fact that in a large number of cases the candidates did not supply full particulars of their experience in wiring work. I would like to appeal to all you gentlemen here, in cases where a man wants to go for this examination, to impress upon him in particular that he must give full particulars of his experience in wiring work apart from anything else.

That is most essential. Finally, I should like to take this opportunity of thanking all the members of the Board for their very kind co-operation and and the sterling work they put in during the year. Thank you. (Applause.)

THE PRESIDENT: Thank you, Mr. Smit. Is there any discussion on that, I don't want to take it now, but if there is any discussion on it and questions then I will put it back on the agenda for discussion later on. So if there is anybody who wants to discuss this please raise their hands now to see if there is anybody. Right then I think we can take that report as read and thank you very much Mr. Kane.

SECOND DAY

9.30 Tuesday morning Convention resumes

THE PRESIDENT: Good morning, Gentlemen, can I have Mr. Chris Downie up on the platform please. I can't see him, oh here he comes (applause.) Do you mind coming on the platform please, Chris? I have to tell you that Mr. Ewing has just had to push off very quickly, his wife has had to go off to hospital, so he may be missing for parts of the day, and we wish him every sympathy with his troubles especially out of his home town.

The first item on the Agenda this morning is Communications from Council. There

are one or two points as regards amendment to the Constitution, which I am going to leave, and go to the appointment of Auditors. Your council has suggested that the same auditors as previously, Messrs. Savoury and Co., be re-appointed. Is that to your approval? (yes) Thank you.

In that case I am going to call upon Mr. Lynch to read his paper to you in regard to developments in Salisbury.

Mr. LYNCH (Salisbury): Mr. President and Gentlemen, I wish to thank you for the opportunity you have afforded me to present "Some Electrical Developments in the Salisbury Area".

SUMMARY.

The introduction to the paper provides a short survey of the characteristics of the load supplied by the City of Salisbury Electricity Undertaking and gives particulars of the rapid growth of load which has been sustained for many years. Under existing conditions, the over-riding importance of capital charges in the cost structure of the Department is stressed and examples of the manner in which reduction in these charges have been sought in the various sections of the Department are then surveyed.

Lower construction costs have been achieved in the Salisbury No. 2 Power Station by restricting capital expenditure on buildings, boiler plant, and switchgear, whilst for the new No. 3 Power Station, further economics are expected to result from the adoption of pulverised fuel fired semi-outdoor type boiler plant.

Distribution expenditure is being reduced by the use of low cost forms of overhead line construction on reinforced concrete poles, gas filled extra high voltage cable, and radio telephone equipment. The difficulties occasioned by wasteful methods of land development and requirements for substation sites and equipment in commercial centres and high density residential flat areas are considered.

Finally the paper deals with the Consumer's section of the Department. The economic and practical advantages of single phase services are stated and the results achieved by the use of ripple injection for the control of the water heater load are noted. Examples of the utilisation of electricity and anticipated developments in the native townships are given.

(1) INTRODUCTION.

It is now eleven years since in 1945, the then City Electrical Engineer of Salisbury, Mr. J. S. Clinton, as President of this Association presented a paper concerning the development of the Electricity Undertaking of this City.

On this occasion I shall not attempt any comprehensive survey of the progress made in the Salisbury Electricity Undertaking. Instead, I propose to describe certain aspects of this development which present

some unusual features and which may provide scope for subsequent discussion. In selecting the items for discussion, I have had particular regard to the need for the utmost economy in capital requirements for the development of electricity supply services as I am sure that everyone present must be deeply concerned with this matter—a problem of vital importance if electricity is to serve the public to the fullest extent in the future.

Those of you who were present in Salisbury at the 1945 Convention and are here again to-day, cannot but have noticed the growth which has taken place in the City. Numerous large buildings have sprung up, the population has trebled, and the net ratable value of the land and improvements within the municipal area has increased from £8,274,167 to £66,836,920. Such rapid development has necessarily brought demands for additional electrical services and the Department has been hard pressed to meet the requirements of its rapidly increasing number of consumers.

No less than 60% of the electricity sold in Council's licensed area of supply, of approximately 580 square miles, is used by domestic consumers in houses and flats. Industrial users purchase about 21% of the output and commercial premises take about 11%. The remaining 8% is largely required for municipal purposes such as street lighting, water and sewage pumping with less than 1% of the units sold being consumed on farms. Having regard to the considerable rural district incorporated within the area of supply, this latter figure must be regarded as disappointingly small since almost 100% coverage has been provided in electricity services to farms, and the curing of tobacco was expected to afford an attractive load clear of the winter peak demand.

It will be seen that the mainstay of the Undertaking is the revenue derived from the sale of electricity to the domestic consumer and it is in this province that some exceptional results have been achieved. Electricity is used in most dwellings for both cooking and water heating so that unusually high figures for the average annual consumption of electricity per domestic consumers are recorded. The graph (Fig. 1) shows the manner in which

this figure has increased over the past 25 years, so that to-day an average of nearly 9,000 units are used per annum by each domestic consumer connected to the mains. This rate of consumption per dwelling is believed to be amongst the highest in the world, but in addition new consumers are being connected in very large numbers, compared with the present size of the Undertaking. There are now about 19,700 consumers and new installations are being connected at the rate of over 250 per month, most of which are in domestic residences and flats. This figure is large in comparison with any city in the whole of Africa.

With regard to the rate of increase in the output of electricity, which has been achieved, the figures are no less impressive, even from the first days of public electricity supply in Salisbury — which was in June, 1913—when the Town Electrical Engineer, Mr. C. H. Baskerville, anxiously awaited the commissioning of the diesel engine driven generators in Council's first power station and wondered how much longer the mobile locomotive type boilers and steam engines, then on temporary hire from a contractor, could stand the increasing strain as more lamps were switched on to the generators each night. The average annual percentage growth of load in the Salisbury area, over successive five year periods, has been plotted for the entire period during which the Undertaking has been operating (Fig. 2) and it will be seen that this has rarely been less than 15%. Of recent years, the figure has fluctuated between 10% and 20% per annum and it is notable that during the last financial year, as many units were sold as in the first

thirty years during which public supplies of electricity were available in the City.

There can be little doubt that the success of the Undertaking in promoting the sale of electricity over the past few years has been due largely to the ability to offer supplies of electricity for domestic water heating and cooking at rates which have proved economically favourable compared with alternative fuels available — such as wood, coal and oil—after allowing for such factors as convenience and cleanliness. Council's tariff for the supply of electricity to private residences (Appendix A) provides for the sale of electricity—after the consumption of a quota at higher rates—at 0.55 pence per unit within the ratable area and subject to surcharges of between 7% and 30% outside this area. Most of the electricity used for water heating is attracted by these low rates and the existing high average consumption per domestic consumer can be maintained only so long as this economic incentive is retained.

With interest and redemption charges upon capital now by far the largest item in the cost of supply, rising interest rates and commodity prices have arrested the fall in the price of electricity to the consumer which prevailed until 1947 and an upward trend brought about by tariff increases found necessary since that date now causes concern. The graph (Fig. 3) shows the average revenue derived from the sale of electricity expressed in pence per unit sold since 1913.

The rapid growth of the Undertaking demand—which has necessitated doubling the capacity of the generating plant and distribution system in less than four years

TABLE No. 1.

Comparative Costs.

ITEM	Cost pre-war 1938/1939	Cost 1955/1956	Percentage Increase
Copper	£ 50 per ton	£ 425 per ton	750%
Power Station Construction	£ 21 per KW.	£ 73 per KW.	248%
Distribution Equipment	Most Items		250%
Labour	3/9 per hr.	8/6 per hr.	127%
Interest Rates	3-0%	5-25%	75%
Coal	£ 1 3s. 2d.	£ 2 4s 10d.	94%
Electricity (pence/unit sold)	1-26	1-32	5%

—has largely removed the cushioning effect against inflationary trends which existing capital assets in plant, buildings and equipment would normally provide in an undertaking growing at a slower rate. The magnitude of the increases in the cost of wages and commodities which largely affect the capital requirements of electricity undertakings can be gauged from the examples given in Table No. 1, against which the increases in the cost of electricity must be regarded as extremely moderate. It is to be hoped that this position can be maintained in the future but if this is to be so, those responsible for the expenditure must explore every avenue in seeking ways to reduce the capital costs of electrical services. If you will bear with me, I propose to examine some ways in which the Salisbury Electricity Department has endeavoured to keep down the costs of generating plant and distribution equipment. Later I shall have something to say of economies which have been effected in consumer's installations and finally I wish to mention developments in the supply of electricity to the native population — for one way of reducing the cost of electricity to the consumer is to sell more of it in a given area.

(2) GENERATION SECTION

(2.1) EFFECTS OF RATE OF GROWTH OF DEMAND ON GENERATION COSTS.

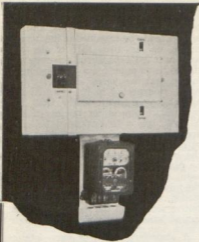
The impact of rising prices has had its most immediate effect upon the cost of generation and the unusually high rate of growth of load in Salisbury has accentuated the impact of this adverse trend in two ways.

Firstly, the amount of plant under construction is very large compared with the total amount of installed plant in service at any given time. It has been found that under present conditions about five years are required from the date of authorisation of a particular plant extension until the machines are in commercial operation. Reference to the curves given in Appendix B shows that with the average rate of growth of load of 15% per annum main-

tained over the past 10 years, and which is expected to be sustained in the immediate future, no less than 121% of the present total installed capacity of generating plant should be on order for commissioning within the next five years. But for the relief which is expected to be obtained by the availability of hydro-power from Kariba by 1960, contracts for no less than four 30 mW. sets with associated boiler plant and other equipment, necessitating a capital expenditure of the order of £9,000,000 for the generation section alone, should now be placed. This figure must be compared with £4,500,000, being the total cost of the present 93 mW. of generating plant installed, and the construction and administrative sections of the department must be geared handle works of this magnitude.

A secondary effect, of some interest, is that the high rate of growth of load must result in the greater part of the installed plant being of relatively recent construction, purchased at inflated costs. Although the advantages of the latest developments in technical progress can be utilised to obtain lower costs of operation, these savings are now more than offset by increased interest and redemption charges, particularly where low running load factors prevail, as is the case with a predominantly domestic load.

The curve given in Appendix C shows how the average age of the plant installed in a power station—weighted in accordance with machine capacity—is related to the annual growth of load, provided that certain stated assumptions, which are generally acceptable, be taken as the basis for calculation. With a 15% per annum average rate of growth of load, the ideal weighted average age of the plant installed is found to be 7.6 years, whilst with 7% per annum average rate of growth of load this figure would rise to 10.2 years. Under these ideal conditions, the undertaking with the slower rate of growth can, therefore, be expected to have plant of a weighted average age 2.6 years older than the undertaking with the more rapid development. In practice, it would almost certainly be economically advantageous to extend the useful life of the generating plant for longer than 25 years provided the annual rate of growth of load is not above 10%, so that



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the weighted average age of plant given in the curve will certainly be exceeded in many of the older established undertakings.

With reasonably stable prices, an additional two or three years in the average age of plant could have little effect on costs of production, but under present day conditions this might well involve an additional 10 to 15% capital charges whilst any resultant reduction in operating costs are likely to be relatively small.

These observations have led the Salisbury undertaking to seek economies in reduced costs of construction, rather than in the reduction of operating costs by the adoption of very high steam pressure and temperature conditions.

(2.2) SALISBURY POWER STATION No. 2 COSTS OF CONSTRUCTION.

With the completion of the No. 2 Power Station, final costs are now becoming available for the construction of this project and Table No. 2 gives a breakdown of the major items of expenditure. It will be seen that the final cost per kilowatt of installed plant is just over £56 10s. 0d. and this figure would appear to compare favourably with the cost of other similar power stations constructed in Southern Africa during the post war period. In making such comparisons allowance must be made for the effects of the steady rise (of about 6% per annum) in power station costs and for this

TABLE No. 2
SALISBURY POWER STATION No. 2 COSTS OF CONSTRUCTION

Stage	1	2	3	Total
Turbo-Alternator No. + MCR (kW)	2 × 7500	2 × 10000	2 × 20000	75,000
Boilers No. + Evap. (Klb/hr.)	— 2 × 87.5	3 × 87.5	4 × 100	837.5
Year Ordered	1942	1948	1950	1942-50
Year Commissioned	1946/7	1952	1954/55	1946-55
Turbo-Alternator and Condensing Plant (£)	123,000	240,000	503,500	866,500
Boiler Plant	211,200	460,000	805,000	1,476,200
Pumps, Pipework, etc.	37,600	64,000	115,000	216,600
Coal Handling Plant (Internal)	12,200	10,400	16,500	39,100
Coal Handling Plant (external)	—	72,200	20,000	92,200
Turbine House Crane	7,000	—	—	7,000
Switchgear Transformers and Reactors	75,900	66,000	180,000	321,900
Cables Lighting and Accessories	30,500	33,800	87,150	151,450
Civil Works*	60,000	118,400	242,000	420,400
Cooling Towers	23,000	47,150	98,700	168,850
	580,400	1,111,950	2,067,850	3,760,200
Consultants and Royalties	29,000	55,850	105,150	190,000
Departmental Work and Supervision	9,000	10,000	13,500	32,500
Interest during Construction	32,000	65,000	123,000	220,000
Prov.	—	5,000	35,000	40,000
Total Cost	650,400	1,247,800	2,344,500	4,242,700
£/kW.	43.36	62.39	58.61	56.57

Weighted mean effective date of commissioning August, 1952

*Includes £40,000 for No.3 Power Station Coal Handling Plant

purpose it is essential to know the mean effective date of commissioning of the plant. For the Salisbury No. 2 Power Station this date is August, 1952. A power station having a mean effective date of commissioning of say 2 years earlier could therefore be expected to be 11% cheaper in construction costs and the equivalent cost of construction would then be £50 6s. 0d. per kW. of installed plant.

The cost of the steam generating plant is found to be the largest single item of expenditure despite the fact that the total steaming capacity of the plant installed has been reduced to the minimum and the full output of the turbo-alternator plant can be assured only when all boiler units are available for service. The elimination of standby boiler capacity has been considered justified by the relatively low annual load factor of the Undertaking (about 45%) which should permit adequate maintenance work to be carried out during the periods of the year when the full output of the station is not required. An additional reason has been the knowledge that, with the commissioning of the more efficient plant in the new No. 3 Power Station next year and later with the availability of hydro electric power, this station must be relegated to the function of carrying peak loads at a very early stage in its economic life.

Little scope has existed for economies in the construction of the turbo-alternator and condensing plant. Standard units of the maximum size considered advisable have been adopted but the small night load has imposed severe limitations on the largest size of machine which could be used and extreme flexibility of operation is an essential requirement if the large daily load fluctuations are to be followed without running excessive amounts of plant. The 20,000 kW. turbo-alternator sets with their short and robust turbine rotors have met these requirements in an outstanding manner and the provision of barring gear is an essential feature for the avoidance of shaft distortion troubles with the present operating conditions.

Electrical equipment, as shown in the costs of switchgear, transformers, reactors and cables, has proved to be an item where economies can be effected by reducing to

the minimum the number of outgoing feeders from the power station and by limiting the rupturing capacity of the switch gear to economical levels by busbar sectionalisation and the use of fault current limiting reactors. The general arrangement of the busbars and main interconnectors, as finally adopted, is shown in Fig. No. 4 and it will be noted that the maximum rupturing capacity of the switch gear on the main and subsidiary boards has been kept down to 500 and 250 mVA. respectively.

Civil works, including foundations and all buildings, have received particular attention with a view to the adoption of the most economical methods of construction and the avoidance of unnecessary expenditure. Reinforced concrete construction has been used to the utmost in the larger buildings, as opposed to the more usual steel framed structures, and has without doubt materially lowered building costs. Nevertheless the resulting structure is of imposing appearance and bears no mark of over-zealous cost cutting. (Photograph No. 1.)

(2.3) SALISBURY POWER STATION No. 3.

Choice of Boiler Plant.

The construction of the Salisbury No. 3 Power Station marks another step forward in the progress of the Electricity Department, both with regard to the size of generating units selected and technical progress from which it is confidently expected that a marked improvement in the thermal efficiency of operation will follow. In Table No. 3, particulars are given of the major design features of this plant, comprising initially two 30,000 kW. steam driven turbo-alternators. Should this be justified, extension to an ultimate capacity of about 180,000 kW. within the site limitations, is possible.

The circumstances existing at the time of the deliberations prior to the construction of this project have led to the adoption of a number of unusual features and in particular the type of boiler plant selected may be of interest. The Undertaking maximum demand and anticipated rate of growth of load made it clear that standard

TABLE No. 3
SALISBURY POWER STATION No. 3.

Design Data

Turbo-Alternator Plant comprising two units of 30,000 kW. continuous maximum rating.

Turbines. Twin cylinder in tandem, of the impulse type with double flow exhaust, operating at 3,000 r.p.m.

Initial steam conditions : 600 lb/sq. in. pressure 850° F temperature.

Back Pressure : 2.0 inches mercury at 24,000 kW.

2.4 " " " 30,000 kW.

Final feed temperature : 340° F. at 24,000 kW.

361° F. at 30,000 kW.

Steam consumption : 9.076 lb/kWhr. at 24,000 kW.

9.472 lb/kWhr. at 30,000 kW.

Alternators of rotating field type, ventilated on the closed air system, with direct coupled exciters, operating at 3,000 r.p.m. Maximum continuous rating : 37,500 kVA, at 11,000 volts.

Condensing Plant comprising two shells of steel plate construction total cooling surface 32,000 sq. ft.

Normal cooling water quantity 21,000 gallons/min. at 80° F.

Boiler Plant comprising three pulverised fuel fired units, each of 210,000 lb/hr. evaporation.

Superheater outlet pressure : 625 lb/sq. in.

" " temperature : 865° F.

Feed temperature : 340° F.

Coal Mills : Three per boiler, capacity 13,540 lb/hr/mill.

Superheater : Horizontal self-draining multi-loop type, having primary and secondary sections. Temperature regulated by gas by-pass damper.

Economiser : Gilled tube type in three banks.

Air Heater : Cross-flow tubular type, having primary and secondary sections with four air passes.

Furnace : Side and rear walls, tangent bare water-tubes. Front-wall, spaced bare water-tubes.

Grit Arrestors : Electrostatic precipitators.

Ash Disposal : Hydro-jet system. Ash collected and quenched in hoppers—intermittently discharged via sluiceway to ash pits and grabbed from pits into lorries. Conveying water recirculated.

Dust Disposal : Hydrovac system. Dust removed intermittently by hydrovacuators via windswept valves to cyclone collecting tanks and discharged via mixer conveyors to lorries.

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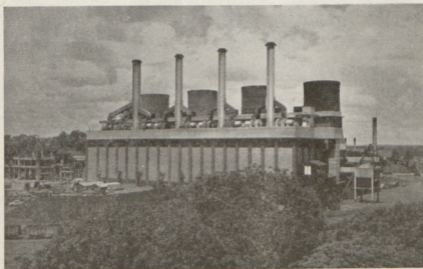
generating units of 30,000 kW. or over—such as would justify the use of higher steam pressures and temperatures—would be economic and since the limiting dimensions and construction features of the No. 2 Power Station buildings precluded straightforward extensions to accommodate plant of this magnitude, a large measure of freedom existed in the choice of future generating units.

There could be little doubt that the construction costs per kilowatt of plant installed would be considerably higher than with the earlier extensions and so the possible economies which might be effected by the use of outdoor plant were investigated. The prevailing climate certainly favoured this development which has been widely adopted in the United States of America, but the very limited experience of British manufacturers in the construction of electrical generators of this type led to the abandonment of the proposal so far as the turbo-alternators were concerned. However, with regard to the steam generating plant, the position was more encouraging

as several manufacturers were prepared to put forward proposals for the construction of boilers requiring the minimum of enclosure and this type of unit has been adopted to yield an estimated saving of £80,000 in civil works.

Another unusual feature—at least so far as generating stations in Southern Africa are concerned—has been the choice of pulverised fuel firing for the boiler plant. At first it was expected that the cost of such plant would be considerably higher than for similar units equipped with stokers, but experience has proved that, for units having an evaporative capacity of 200,000 lb./hr. and over, the differences in costs occasioned by the choice of the various methods of firing are very small.

Concern has been expressed that pulverised fuel firing might cause a dust nuisance in the vicinity of the power station but developments in the design of electrostatic precipitators give confidence that, with the use of suitable dust collecting and handling plant, no inconvenience will be caused in



PHOTOGRAPH No. 1.
Salisbury No. 2 Power Station. Total installed capacity 75,000 kW.

surrounding properties. The disposal of the waste product is not expected to present difficulties and several enquiries have already been received regarding the availability of such material for use in road construction and concrete work.

The advantages which the Department expects to derive from the use of pulverised fuel firing are considerable.

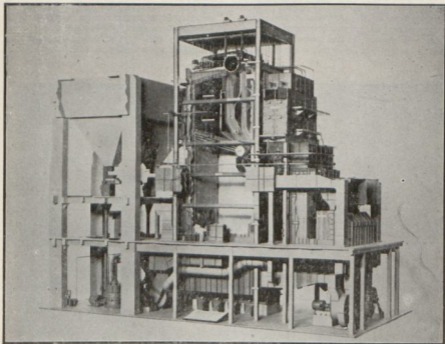
The thermal efficiency of operation is expected to be substantially improved due to the more efficient combustion obtained and the elimination of losses occasioned by the necessity to keep banked fires in stoker fired boilers during periods of low load.

Higher availability is expected, as chain grate stokers have been found to be one of the least reliable components of the existing boiler plant and repairs usually necessitate taking the boiler out of service to cool down before work can commence.

With pulverised fuel firing, maintenance work can proceed on at least one of the mills with the unit in service. It is also established that the heat transfer surfaces can be expected to remain clean longer than with stoker firing and so less outage time and labour should be required for off-load cleaning.

Wankie coal, as is used throughout the Rhodesias, is particularly suitable for use in the pulverised form, being easily grindable and of unusually low moisture content. The ability to burn any grade of coal which may become available at any time may become an important economic asset should quantities of otherwise unsaleable fuel be accumulated. The coal to be used can be selected almost entirely on the basis of the cost per British Thermal Unit delivered.

Looking to the future when Salisbury Power Station may be required to provide



PHOTOGRAPH No. 2.

Scale model of semi-outdoor pulverised fuel fired boiler unit for the Salisbury No. 3 Power Station.

static or spinning reserve plant for the supertension network interconnecting the power stations of both Rhodesias and energised largely from the hydro-electric station at Kariba, the ability of this type of boiler plant to pick up load with extreme rapidity and the low standby losses must become pronounced advantages.

Once having decided to adopt the pulverised fuel method of firing, the boiler unit size could have been increased to about 300,000 lb./hr. evaporative capacity so that one boiler could steam one turbine at full load. This arrangement would have provided a lower overall cost per kilowatt installed but the need for the utmost dependability in the early years of independent operation led to the decision to purchase three boiler units, each of 210,000 lb./hr. evaporative capacity, and an interesting scale model of these boiler units is available for inspection. (Photograph No. 2.)

(3) DISTRIBUTION SECTION.

The area in which electricity supplies are afforded by Council is shown in Fig. 5. Besides the municipal area comprising the City of Salisbury, there are included eight Town Management Boards and a surrounding rural area. In order to indicate the degree of electrical development which has taken place, the number of low tension transformer points and the aggregate capacity of these transformers in each of the areas has been given. It will be noted that a very wide range of loading density exists within the area of supply.

In the central city area high tension distribution is effected from an 11 kV. interconnected underground cable system and load densities of the order of 7,000 kW. per square mile are encountered. Much of this load is concentrated in large multi-storey commercial buildings, blocks of flats and hotels. The proportion of space heating load which may be connected is often large compared with the remainder of the load in these commercial buildings so that extreme care in the selection of substation transformer sizes is necessary if damage to the equipment is to be avoided with the sudden incidence of cold weather. Transformers possessing a high inherent over-

load capacity are of particular value in meeting such duty, as the number of days in each year when this space heating load is required, are few and the smaller transformer can meet all normal load requirements. Low Tension distribution is usually effected from standard substations of about 500 kVA. capacity incorporated in consumers premises and underground low tension distribution is adopted.

Within the residential areas of the City load densities are about 1,500 to 2,000 kW. per square mile and the demand per house is often in excess of 3 kW. after allowing for diversity. High tension distribution by underground cable at 11 kV. is usually adopted as for the city central area, but low tension distribution is usually by overhead line on reinforced concrete poles constructed along the rear stand boundaries and fed from standard brick built substations or kiosks of about 500 kVA. capacity.

The Town Management Board areas are residential townships and tend to be dormitory suburbs for the city workers. Due to the fact that land sub-divisions in such areas are often limited to a minimum of one acre, the average load density is usually about 500 to 800 kW. per square mile and economical forms of distribution must be adopted. High tension distribution is at either 11 or 33 kV. on overhead lines supported on reinforced concrete poles. Pole mounted transformers are used up to 150 kVA. but standard open cage type substations or kiosks are used when justified by load density. In order to preserve the amenities of these suburbs, low tension distributors are taken along servitudes at the rear stand boundaries as in the city residential areas. The township of Mabelreign, which has been developed by the Government in an orderly manner to provide low cost housing, presents a notable exception as within this area load densities of the same order as those existing within the municipal residential areas are found. The reduced cost of providing services to these houses has justified a lower connection fee and tariff for the supply of electricity.

The remaining area, with a few exceptions comprising privately developed residential townships, is mainly rural and has

a very low average load density of about 50 kilowatts per square mile and this is serviced by overhead lines and pole mounted transformers of the lowest cost permanent construction.

Photographs Nos. 3 to 7 illustrate examples of standard line and substation constructions adopted, which have made wide use of reinforced concrete products manufactured in the Department's workshops.

(3.1) ECONOMIES IN LOW TENSION DISTRIBUTION.

The low tension distribution of electricity to residential premises has tended to be costly due to certain factors outside the control of the Department. In particular, the relatively large average size of residential plots and haphazard land development have required unusually long service and distribution mains so that the most economical forms of overhead line construction are sought.

Within the municipal area land development has taken a reasonably orderly course. The average size of residential plot has tended to fall from $\frac{1}{4}$ or $\frac{1}{2}$ acre until Council is now sponsoring schemes for the construction of low cost housing at a density of eight dwellings to the acre in garden units. Of even greater importance is the fact that most of the land available for new housing is at present in the ownership of Council and this land is town planned, sub-divided and sold in blocks comprising up to 200 stands. Conditions of sale provide for the erection of a dwelling upon each stand within about 12 months from the date of transfer, so that the Electricity Department is enabled to lay down a distribution system to serve the area in the knowledge that it will be in full economic use within a few months of construction. However, the number of building plots which can be made available for sale to the public within the municipal area falls far below present demands so that over half of the new house construction within Council's licensed area of electricity supply is now taking place outside the city limits.

The position is much less satisfactory in these more extensive peri-urban areas. Residential plots are limited to a minimum size of two acres unless an approved pub-

lic water supply is available, in which case sub-divisions of a minimum size of one acre are permitted. The land available for housing is nearly all in private ownership and the course of development has to a great extent been determined by the interests of the land owners and contrary to the requirements of the economical supply of public services such as electricity and water.

It may be of interest to quote a recent example of such development in the form of an estate comprising just over 200 stands of approximately one acre in extent situated about seven miles from the city centre. When placed upon the market these stands were all sold within the course of a few weeks, but from subsequent building progress in the area it is clear that most of the plots were purchased as land speculations and the present owners have no intention of building thereon. In fact it is found that 12 months after the sale of the land, houses have been erected upon only 20 stands scattered at random.

The capital expenditure for electricity distribution in the area has amounted to some £15,000 and this is completely exclusive of the capital required to bring the supply from the power station. Indications are that it may well be 10 years before the distribution system constructed for this township is fully utilised and since this type of development is taking place in all areas round the city perimeter, it is assuming alarming proportions in capital outlay.

Development schemes promoted and carried out by large contractors do not raise the same problems, in that these take place on orderly lines and several examples of such schemes can be cited where the greatest number of consumers are connected for the least capital outlay. Here, of course, houses and not land are, in effect, being sold.

It is suggested that, having regard to the necessity to conserve capital resources in a rapidly developing community, there is urgent need for the Government to introduce into the town planning legislation provisions whereby authority for future major sub-divisions of land for residential purposes is made conditional upon the fix-

ing of a limited period during which holders of title to the stands would be required to build a house thereon. This should ensure that such building plots as are available are purchased only by those willing and able to construct a dwelling thereon at an early date, and the wasteful sub-divisions of land is discouraged. There are obvious difficulties in the implementation of such a proposal, particularly with regard to enforcement, but the alternative requiring the estate developer to provide the capital for electrical services, as is already the case for roads and water reticulation, would not discourage the land speculator as the extra cost of electricity reticulation would merely be added to the cost of the building plot.

However, desirable as these legislative provisions may be, the Department is required to provide electricity to these widely dispersed residences at the lowest practicable cost. Details of the standard low tension overhead line construction of reinforced concrete poles, using copper conductors in vertical arrangement, is shown in Figure No. 6. Services are invariably single phase unless very exceptional circumstances such as the installation of motors in excess of 3 h.p. unit size justify a departure from this rule. The reinforced concrete poles are manufactured in the department's own plant and now cost £7 5s. 2d. each for the standard 28 ft. pole. The span between poles is of the order of 200 ft. but it may be a lesser figure as dictated by the position of the common plot boundaries.

Further economies have been sought by the adaptation of the standard construction to permit the use of aluminium conductors and Fig. No. 7 shows the modifications adopted. At first it was anticipated that the large price differential between the two metals would give a considerable net

saving in favour of aluminium. However, this has not proved to be the case, as will be seen from the table of figures scheduled below. These figures give the actual costs of construction 450 yds. of comparable line in 7 x 0.136" diameter copper and 7 x 0.173" diameter aluminium as illustrated in these above drawings, with the main line poles equipped to take services off to adjacent properties.

It will be noticed that the lower price of the aluminium conductor is largely offset by the higher price of "copper to aluminium" fittings at service connections and increased labour charges, the latter being due to the use of special apparatus and the additional care needed-throughout construction.

A saving of about 8% has been achieved, but the line has a somewhat lower capacity due to voltage drop limitations, and insufficient time has elapsed to prove whether the new fittings have eliminated corrosion troubles experienced with aluminium low tension lines of earlier construction. If these trial lines withstand the test of time, and the staff becomes more familiar working with aluminium, it may be possible to effect savings of the order of 12 to 15% which would justify a more liberal adoption of this metal for low tension overhead reticulation.

(3.2) USE OF GAS FILLED 33 kV. CABLE.

The Department has been the first public supply authority in the Central African Federation to make use of the gas-filled cable. The cable used is of the pre-impregnated paper insulated type having three copper conductors of 0.3 sq. in. circular section. These three screened conductors are enclosed within a lead alloy sheath, armoured and served, to withstand a normal working

Cost of Construction 450 yds. LT 3 phase and neutral Overhead Line :

<i>Conductor</i>	<i>Wire</i>	<i>Poles</i>	<i>Fittings</i>	<i>Labour</i>	<i>Transport</i>	<i>Total</i>
Copper 7/0-136"	£ 270	£ 80	£ 50	£ 125	£ 25	£ 550
Aluminium 7/0-173"	£ 145	£ 80	£ 100	£ 150	£ 30	£ 505

pressure of 200 lb/sq. in. of nitrogen gas within the sheath. By operating the cable under this gas pressure, the maximum electric stress of the dielectric material can be increased to 75 kV/cm. compared with about half this figure which is usual for solid type cables, so that the thickness of the paper insulation has been reduced from about 0.3 inches to 0.115 inches.

The copper conductors can also be operated at a much higher temperature as there is no risk of destructive voids forming within the insulating material due to repeated expansion and contraction over a number of heating cycles. The 0.3 sq. in. conductors are therefore capable of carrying the same maximum continuous current of 390 amps. as a solid type cable having 0.5 sq. inch sectional area of conductor.

Very considerable economies have been effected by the utilisation of the design features of this type of cable and the reduction in physical size is graphically demonstrated by the two drawings (Figs. 8 and 9) showing to the same scale the cross section of the gas-filled cable as used, together with a typical equivalent solid type cable. The conditions of tender under which this cable has been supplied were unusual in that the specification called for the supply and delivery of material, excavating and filling of trenches, laying and jointing of the 33 kV. cable and pilot cable, and the execution of all works culminating in the final commissioning of the feeder between the power station and substation over 7 route miles at an all inclusive price. The tendered price for this work was £93,000, including a provisional sum of £10,000 and based upon the following metal prices:—

Copper	£292	0	0	per long ton.
Lead	£106	5	0	" " "
Armouring wire	£52	5	0	" " "

Upon this basis a saving of £37,507 over the conventional solid type cable needed to transmit the same amount of power. The sudden rise in the price of copper at the time when this contract was negotiated resulted in this material being purchased at £345 per ton and since the weight of copper used in the gas filled cable is less than for the solid type in the ratio of 3 : 5 the price increase due to this item, will be less in proportion.

A further point of interest is in regard to the length of cable which can be accommodated upon each drum. This has been increased from 1,315 ft. for solid cable to 2,630 ft. for the gas filled cable for drums having an overall weight of 14.2 and 12.53 long tons respectively. The number of drums to be handled and weak links in the form of joints has therefore been correspondingly reduced.

As is to be expected a price must be paid for the capital savings brought about by the use of this type of cable and this takes the form of increased transmission losses due to the reduced copper cross-section of the conductor. The calculation given in Appendix D shows that the annual extra cost of these losses will be £375 which bears most favourable comparison with the capital savings given above.

(3.3) USE OF RADIO TELEPHONE EQUIPMENT.

The Department has not been slow to take advantage of the developments in radio telegraphy to assist in the day to day working of the distribution system. Readily available inter-communication between the control centre and key personnel situated at any point in the area of supply is becoming an essential requisite for the safe and effective operation of an interconnected distribution network, whilst under emergency conditions arising from system faults the restoration of supplies can be very greatly expedited when such a communication system is in use.

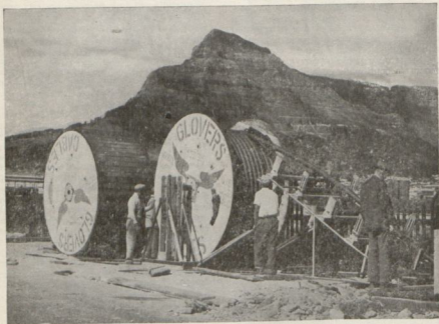
In 1945, with the co-operation of the Department of Posts and Telegraphs, an experimental installation comprising a 40 watt transmitter/receiver operating simplex on a wave length of 144 metres situated at the Wynne Street Headquarters; with two mobile units, one long range (nominal 40 miles) and another short range (nominal 5 miles), was in use. However, due chiefly to serious difficulties experienced in obtaining reliable inter-communication during the hours of darkness and the excessive size and weight of the long range mobile equipment, the installation was abandoned pending the commercial development of more satisfactory equipment.

By 1952, the radio industry was in a position to offer standard v.h.f. equip-

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ment which appeared to be very suitable for the duty required and in the following year, manufacturers were invited to demonstrate trial installations of the equipment they were able to offer. In the light of experience gained during this period, tenders were invited for the supply of a complete radio telephone installation to serve the Department and the equipment purchased comprises:—

1. A fixed radio telephony station designed for remote controlled duplex operation, transmitting at 77·815 megacycles/sec. and simultaneous receiving at 71·615 megacycles/sec. The transmitter power output is 100 watts and frequency modulation is adopted.
2. Seven mobile stations, suitable for installation in standard road vehicles, each comprising a 15 watt frequency modulated transmitter with integral receiver unit suitable for simplex operation, the frequencies for transmitting and receiving being respectively the converse of those adopted for the fixed station.

The main station situated at the top of the Salisbury Kopje is remotely controlled, over private line pairs with earth return, from either power station control room or from the Wynne Street offices of the distribution section of the Department. A special line switching unit has been installed at the power station and, according to the setting adopted, control of the transmitter may be effected from either point as may be convenient. Both control points can monitor all incoming calls and the point in control may be monitored by the second control point. Normally operation is effected from the Wynne Street offices and the engineer in the power station control room is able to listen-in to all messages conveyed over the radio communication system. He is thus able to follow load changes as they affect the main distributors from the power station and so form a complete appraisal of the reasons therefor.

All of the mobile stations may be called simultaneously; alternatively selective calling of any one of the seven mobile units from the control point is possible. A "talk through" or "repeat" facility enables any

two of the mobile stations to communicate with each other through the main station, which then acts as a relay or repeater. Direct communication between the two main station control points is also possible over the private line pairs without the conversation being broadcast.

Two of the mobile units have been installed in light vehicles used by engineers in charge of operations in the distribution section and the remaining five units are fitted in one ton trucks equipped with special bodies for faults and maintenance work. The equipment is of robust design, reasonably compact and causes no interference with the normal operating of the vehicle. The power supply for operating the unit is drawn from an independent 12 volt, 120 ampere hour, lead acid battery and the current taken is approximately 5·2 amps. while on standby for incoming calls, 8·8 amps while receiving, and 16·5 amps when transmitting. The total cost of the installation as described above was approximately £4,500 and two additional mobile units, one to serve the consumer's section of the Department and one standby are now on order.

The benefits derived by the Department from this installation have fully justified the cost. The time for arrival on fault or consumer's complaint has been reduced on average from 43 minutes to 23 minutes and the average time required for restoration of supply following a distribution fault has been lowered from 59 minutes to 38 minutes. Approximately 3,500 such calls are dealt with each year. In one large routine switching operation carried out recently it is estimated that the time required was reduced from 2½ hours to 1 hour 10 minutes and total distance covered by road vehicles was lessened by over 100 miles, compared with the same operation conducted before the radio communication system was available.

Much more effective use can be made of the labour allocated to the maintenance of distribution equipment. For example, if difficulty is experienced in completing a particular assignment, additional labour with equipment can be made available at short notice from men occupied on less essential work. Faultmen on shift work can be

allocated routine duties away from headquarters without interfering with their primary function, that is their availability to attend to system faults and consumers' complaints as and when these occur. In all, it is estimated that these factors have increased the effectiveness of such personnel by about 20%. In other words, five skilled artisans employed on distribution maintenance work with supervision by radio-telephone equipment can do the work of six such employees lacking this facility and at the same time a definite improvement in continuity of supply is achieved.

(3.4) SUBSTATION REQUIREMENTS IN COMMERCIAL AND FLAT DEVELOPMENT AREAS.

The cost of acquiring substation sites and buildings can have a marked bearing on capital requirements for electricity distribution purposes and this is particularly so in commercial centres and residential areas where high density flat development is taking place. The Department has endeavoured to reduce these costs by reserving the right to require large consumers to provide the necessary substation buildings at no cost to Council. The plant installed in these substations is used to supply both the buildings situated on the stands and any surrounding properties as may be dictated by the loading of the low tension distribution system in the locality.

Complaints are received, from time to time, from the owners of buildings in which these substations have been provided when they learn that similar buildings which are being erected in close proximity to their own, are to be supplied from the electrical equipment installed in their premises and so the owners of the new buildings will not be required to incur the cost of building substations. They claim that the Department or the consumers who receive a supply from equipment installed in their premises should make some payment, either by way of a capital contribution or rent, in respect of the building they have provided. It must be admitted that some inequity of treatment exists as between consumers, and the reasons which have led the Department to pursue its present policy may be reviewed.

The practice adopted in Salisbury is briefly as follows:—

1. Consumers, where the demand exceeds 50 kVA., may be required to provide, free of charge, accommodation to the approval of Council for the housing of transformer and switchgear for their own supply and, if required, for two outgoing low tension or high tension feeders with associated equipment therefrom to Council's network.
2. An ordinary low tension connection fee of £10 is charged in the case of flats or buildings not requiring H.T. tariff, plus £5 per meter for each extra consumer regardless of whether a substation is installed or not. The total connection fee to a block of flats requiring a substation is usually between £80 to £100.
3. The average space requested is approximately 2,500 cu. ft.
4. All equipment, including fire protection, is installed and maintained by Council. The average cost is between £1,800 and £2,000. This does not include the cost of the e.h.t. cables to supply this equipment, which can vary from £300 to £3,000 depending on the distance from existing e.h.t. cables.

The standard substation building to be provided by the consumer would be generally as shown in Fig. 10 and this may, with slight modifications be incorporated in the ground floor of the main structure of the building.

At the outset it must be conceded that the application of the above principles in high density built-up areas leaves the Department with the greatest freedom of choice in selecting the most suitable of the available substation sites and also enables the distribution system to be planned so that the maximum use it obtained from the plant installed in any substation. It follows that the overall requirements of capital for the purchase of distribution plant and equipment to meet the connected loads will therefore be reduced to the minimum and in addition the Department is relieved in many instances of the costs of acquiring land for substations and erecting buildings thereon.

In this connection it may be mentioned that, had sole-user substations been installed in each large building in a group as is now supplied from a mutual service substation, instead of only the owner of the first building being required to incur costs of the order of £500 for space and buildings for electric services, under present conditions in the City; the owners of the group of buildings taken together would have paid an additional £4,000 for plant and equipment and would each have been required to provide a substation building. The capital cost of equipment which is not directly related to the transformer capacity is approximately £600, and this would be required in each substation whether the transformer capacity be 50 or 750 kVA.

The problem of the dissatisfied owner of the first building remains. He may be informed that the mutual service substation he has built would have been no smaller had its use been limited to affording supply to his property, and also advised of the extra charges incurred by the owners of buildings so isolated that mutual service substations are impracticable, but nevertheless he may still claim some recompense in respect of the savings effected by the joint use of a part of his building.

To the problem of equity there is no satisfactory answer for the following reasons:—

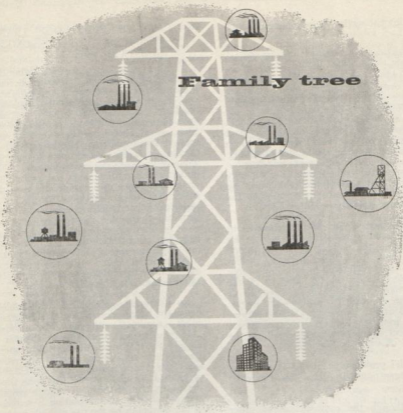
1. Although the right to supply other consumers is reserved, this right is not always implemented and it is not possible to predict whether or not this is likely to be so at some future date. In fact a given substation may change from that of sole-user to mutual service from time to time to suit the convenience of working on an interconnected distribution system.
2. Any equitable method of apportioning the relatively small capital costs incurred by an owner in providing accommodation for electrical distribution equipment as envisaged must be complex and in application would adversely affect the cost structure of the Department out of all proportion to any advantage gained by the consumer.

(3.5) USE OF FIRE-PROOF TRANSFORMERS IN CONSUMERS' SUBSTATIONS.

Fire prevention and insurance authorities are tending to become increasingly conscious of the very extensive damage which can be occasioned by fire and explosion resulting from the failure of electrical apparatus containing large quantities of oil such as oil circuit breakers and oil immersed transformers. The assessment of this hazard is often based upon the calorific value of the materials contained within the building, rather than upon the probability of the occurrence of a serious fire, and the owners of large buildings incorporating electrical substations are now faced with demands that automatic fire extinguishers must be fitted to protect this oil filled electrical equipment. Automatic fire extinguishing apparatus of approved type is very costly to install and in order to be effective must receive careful maintenance including routine testing at frequent intervals.

An alternative solution to this problem lies in the elimination from such substations of all equipment containing oil in considerable quantities and, since the transformer is usually the major offender in this respect, the Department is now making increasing use of air cooled transformers with Class B or Class H insulation. At the same time, the oil content of the high voltage switchgear installed in the substation is reduced to the minimum by the use of high rupturing capacity fuses incorporated in ring main isolator units in place of oil circuit breakers. The same practice is adopted on the low voltage side, where fuses and isolators are used in preference to oil circuit breakers. It has been found that the capital costs of such low fire risk substation installations compare favourably with those incorporating conventional oil filled transformers and equipped with approved automatic fire extinguishing apparatus. It is also to be expected that upkeep and maintenance costs will be lower due to the simplicity of the equipment and the absence of transformer oil.

A secondary, but nevertheless important advantage of the air cooled transformer, and in particular those insulated with Class H materials containing silicone compounds,



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is the higher short period overload capacity which often enables smaller units to be installed in substations serving commercial buildings where the load is characterised by very low annual load factors. Measurements taken in such buildings over the past three years have indicated that a fall in day temperature from 74°F to 61°F can have the effect of increasing the demand by over 90% for a period of about two hours during the morning. Such conditions occur in Salisbury on some six days during the year and it is only on these occasions that the higher loadings will be encountered. Under these conditions it may be found that a 300 kVA, air cooled transformer can replace a 500 kVA, oil immersed unit and that the higher losses incurred during the short period of overload operation are more than offset by the lower losses prevailing throughout the remainder of the year. In short, one may well find that both the lowest capital charges and least running costs are achieved when the smallest air cooled transformer, which is capable of meeting the annual peak demand without damage, is used.

Comparative costs and data for these various types of 11/0-38 kV, indoor distribution transformers, as used on the Salisbury system, are given in Table No. 4.

TABLE No. 4
COMPARATIVE DATA FOR 11/0-38 kV. TRANSFORMERS

Capacity Maximum continuous rated	300 kVA.			500 kVA.		
	A	B	C	A	B	C
Type (see below) ---	---	---	---	---	---	---
Cost ---	£	603	1,248	1,134	855	1,718
Losses at no load (kW.) ---	1-113	1-500	1-200	1-683	2-420	1-810
Losses at M.C.R. (kW.) ---	5-715	4-870	5-450	8-603	6-880	8-210
Estimated 2 hr. overload capacity ratio ---	1	1-6	1-8	1	1-6	1-8
Floor space ratio ---	1	1-2	1-2	1	1-2	1-2
Weight ratio ---	1	1-08	1-08	1	1-08	1-08

TYPE A—Standard oil immersed transformers in air cooled steel tanks manufactured to B.S. 171.

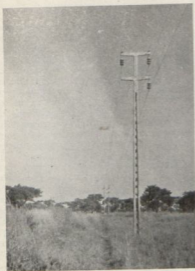
TYPE B—Air cooled transformers with Class B insulation consisting of mica, asbestos, fibre glass and similar inorganic materials with organic binding cements.

TYPE C—Air cooled transformers with Class H insulation consisting of mica, asbestos, fibre glass and similar inorganic materials with binding cements of silicone compounds, or materials with equivalent properties.

(4) CONSUMERS' SECTION.

The section of the Electricity Department falling within the province of the Consumers' Engineer includes an administrative section dealing with the application of Council's tariffs for the supply of electricity to individual consumers and the implementation of the regulations covering the required standards of construction in consumers' installations. In addition, this section of the Department embraces a fully equipped meter testing station with meter and relay repair facilities handling upwards of 2,800 instruments per annum. The installation branch of the section is responsible for the installation and maintenance of electrical equipment in Council's buildings and works including hospitals, offices, stone quarries and pumping stations. The work undertaken by this branch also includes the wiring for electric lighting in more than 7,000 houses in the Municipal Native Townships of Harari and Donnybrook.

The fact that this section of the Department actually undertakes all classes of electrical work ranging from the wiring of a few house lighting points to complete installations in large buildings such as the Council owned Trafalgar Court which con-



PHOTOGRAPH No. 3.
Standard 33 kV. overhead line conductor on 45 ft.
reinforced concrete poles.



PHOTOGRAPH No. 4.
Standard 11 kV. overhead line conductor on 40 ft.
reinforced concrete poles.



PHOTOGRAPH No. 5.
Standard 38 V. overhead line construction
on 28 ft. reinforced concrete poles.



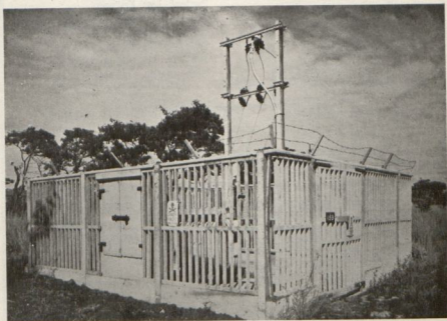
PHOTOGRAPH No. 6.
Standard 11/0-38 kV. pole mounted transformer
with associated equipment.

tains 144 flats, 60 offices, seven shops and a restaurant in one building, enables the Department to make a first hand appraisal of installation practices likely to benefit the consumer. Of recent years, two important changes in installation practice have been adopted in order to reduce the cost of standard residential consumers' installations. The first measure was the standardization on single phase services for residential premises in place of the three phase installation previously required where electric cookers were used, and the second has been the permissive use of 13 amp. socket outlets on ring circuits. Since these practices have not been generally adopted in Southern Africa, a review of the

economies which are effected thereby may be of interest.

(4.1) COMPARATIVE COSTS OF THREE PHASE AND SINGLE PHASE SERVICES TO RESIDENTIAL PREMISES.

The lower costs brought about by the use of single phase services, in place of three phase supplies, to domestic premises benefit both the supply authority and the consumer. Only two service wires will be run to the house, instead of four, a single phase cut-out and meter will be used, and on these items the capital cost of affording a supply is reduced by £12 10s. 0d. per consumer as follows :—



PHOTOGRAPH No. 7.

Standard 11/0-38 kV. open cage type substation.

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Cut out	1 14 0	12 6
Meter	14 0 0	3 11 6
Total	£17 14 0	£5 4 0

The lower costs incurred by the consumer are more difficult of precise assessment, but are nevertheless considerable, and are estimated as being of the following order:—

(a) Main feeds from overhead lines to cut outs (on average 20 ft. run)	£2 10 0
(b) Main distribution Board	5 0 0
(c) Cooker Control unit	3 0 0
Total	£10 10 0

The annual saving in capital charges to the Undertaking therefore amounts to about £25,000 on 2,000 consumers connected in the year. These consumers will also save about £20,500 in installation costs if single phase services are adopted as standard practice for residential premises.

Single phase supplies for cookers at 220 volts are not only cheaper but also safer than the alternative three phase connection where a potential of 380 volts exists between phase wires. It is unfortunately a fact that many cookers are connected to the control units by the random coupling of wires to terminals and it may be mentioned that the five wires joining the three phase cooker control unit to the three line, the neutral, and the earth terminals on the cooker can be connected in no less than 120 different ways, of which only six may be regarded as safe. On this score, the scope for the uninformed home handyman to endanger himself and other people is greatly restricted with the single phase installation having only three wires, which may nevertheless be connected in six ways only one of which is satisfactory.

(4.2) USE OF RING CIRCUITS FOR 13 AMPERE SWITCHED SOCKET OUTLETS.

For the past three years, the use of 13 ampere socket outlets with fused plugs, manufactured in accordance with BSS No. 1363, wired on ring circuits, each ring serving up to ten socket outlets, has been permitted. Council's regulations have been amended as indicated in Appendix E to permit this practice and on ten socket outlets a saving of £4 to £6 is possible, compared with the use of five fused circuits feeding ten 15 ampere socket outlets in accordance with the earlier required standard.

The experiment has proved successful in that the majority of new residential installations now use these 13 ampere socket outlets, but it is evident that some measure of education of the public will be necessary before the reluctance of consumers to purchase and have available the necessary cartridge fuses can be overcome. There is a very real danger that this type of

installation will fall into disrepute occasioned by the malpractice of consumers bridging out the protection fuses by the use of wire or silver paper. The cartridge fuse holders are usually made of plastic materials which are very liable to charring and cracking if misused in this manner and it has been found advisable to warn consumers of this danger—by the issue of circulars dealing with the matter.

(4.3) USE OF RIPPLE CONTROL GEAR TO LOWER COSTS OF SUPPLY.

During the past four years the consumers' section of the Department has been actively engaged in the installation of relays in consumers premises which—actuated by a high frequency ripple voltage injected into the system—can switch on or off the water heaters by remote control from the power station. Due to the large domestic load, a very sharp peak occurs during the evenings between the hours of 6 and 7 o'clock and any reduction in this peak can effect very material economies in the amount of generating plant and distribution equipment required to meet the annual system maximum demand. Consumers are, therefore, offered in terms of Council's tariff for domestic supplies (see Appendix A) electricity at 0.55 pence per unit provided the right to install this control equipment is afforded to the Department. Otherwise the lowest charge applicable is 1.25 pence per unit. Similar provisions exist under the tariff for the supply of electricity for water heating, cooking and steam raising in non-domestic premises.

Consumers have been very willing to take advantage of this facility and by July, 1955, 5,549 relays were operating in this manner on the system. The annual maximum demand was thereby reduced from an estimated 71,200 kW. sent out to 64,600 kW. sent out and the annual system load factor has been improved from 43.5% to 47.5%. This reduction in system demand has resulted in capital savings of the order of £500,000 against which must be offset the cost of the central control equipment (£13,000) and relays at £7 each installed.

The equipment is normally used for the purpose of water heater control, only

during the months of June, July and August, between the hours of 6 and 7.30 p.m., when the highest system demands are encountered so that very little, if any, inconvenience is caused to consumers. In addition, the equipment provides control for street lighting throughout the year and may be used in an emergency at any time to reduce the system demand for a short period.

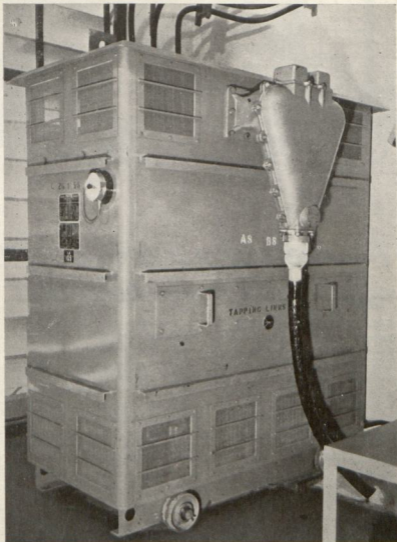
Since to err is human, it may be recorded that one consumer whose lighting had inadvertently been connected to the ripple controlled circuit felt that the inconvenience occasioned by the installation of the relay was much underestimated and expressed his willingness to incur the extra cost of an uncontrolled supply. However, when the error had been rectified he readily agreed that he could notice no difference in the supply of electricity to his premises when the relay was in circuit.

(4.4) UTILISATION OF ELECTRICITY IN NATIVE TOWNSHIPS.

Having regard to the development of the native population, both in numbers and social environment, the Department expects the sales of electricity in the Native townships to increase very rapidly in the foreseeable future. There are three major Native townships within Council's area of electricity supply and approximately 5,000,000 units are now used per annum mainly for lighting purposes. Two of these townships—namely Harari and Donnybrook—have been built and developed by Council, the accommodation being rented to the occupants, whilst the third—Highfield—is a Government housing scheme where the building of houses for sale to the Native population is now being actively pursued.

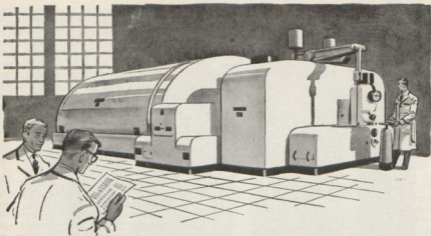
Dwelling units in these townships include some 8,000 houses for married Natives living with their families and 40 multi-storey hostel blocks in which some 16,000 Natives are housed, most of whom are migrants from surrounding territories. Photographs No. 9 and 10 show examples of both types of housing.

Whilst, at present, electricity for lighting is available in the houses and the cost of this service is included in the rent, it is to



PHOTOGRAPH No. 8.

300 kVA. air-cooled transformer 11/0-38 kV. Class B insulation,
installed in consumers' substation.



Turbine oil still good as new after 34,498 hours operation

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be expected that an increasing number of tenants will wish to have installed additional electric equipment such as hotplates for cooking and socket outlets for irons, radios and possibly refrigerators. In order that such facilities may be readily provided on a commercial basis at some future date, the houses wired during the past few years have provision for fitting individual meters and service cut-outs. The box designed to house this equipment may be seen on the end outer wall of the house shown in photograph No. 10. When there is sufficient demand, the Department will be in a position to offer individually metered supplies to selected Native tenants who require and are prepared to pay for the service.

Electricity is now being increasingly used for cooking purposes in the multi-storey hostel blocks, but before this was possible the Department found it necessary to develop a special hot plate table upon which the Natives could cook their own food. One of these tables is shown in photograph No. 11 and 104 of these cookers are now in use and a further 177 have been ordered for use by the Native Administration Department.

The top surface is of cast iron, 54 inches long by 20 inches wide, in three sections, and is uniformly heated by sheathed mineral-insulated elements clamped to the cast iron plates. The total loading of the three plates is 12 kW. Control is by a metal clad on-off switch fuse unit mounted on the wall near to the cooking table and the aim has been to provide a low cost inherently safe cooking unit for communal use. In order to increase the speed of cooking, and incidentally the diversity of the load, a thermal storage water heater is provided in the same room so that the cooking pots may be filled initially with hot water. These cookers cost £90 installed and it is found that one unit can serve approximately 70 natives.

Electric food boilers of the farm type, as shown in photograph No. 12 have proved very satisfactory for the preparation of large quantities of soup in the kitchens which each serve mid-day meals to upwards of 2,500 Native children. Each unit has a capacity of 54 gallons and with an

electrical loading of 6 kW, the cooking time is three hours. A safety cut-out, to prevent damage should the container boil dry, is incorporated.

The short supply and increasing cost of firewood has led the Department to investigate the cost of electric cooking by means of hot plates installed in the houses for married Natives and a number of these houses have been provided with 700-800 watt hotplates on an experimental basis. It has been found that the unrestricted consumption in houses equipped for lighting only is about 20 units per month whilst in comparable houses where these hotplates have been provided, this figure rises to about 200 units per month. Having regard to the high density of housing development in these areas and the correspondingly lower cost of distribution, it is considered that individually metered supplies could be made available on an economic basis provided the Department could be assured of an average revenue of about £1 per month per consumer in respect of an average consumption of about 200 units per month.

There can be little doubt that the demand for such electrical services in the Native townships will grow and retailers of electrical goods already report numerous sales of multi-adaptors, radios, irons, hotplates and similar equipment to Native customers. It is surely better for the Department to follow a progressive policy by catering for the demand occasioned by the aspirations of this large section of the community rather than that it should be suppressed by endeavouring to prohibit the use of unauthorised equipment on supplies restricted to lighting and paid for in the rent account.

ACKNOWLEDGEMENTS.

In conclusion, I wish to thank the Salisbury City Council for their support in enabling me to prepare and read this paper and also to acknowledge the encouragement and advice of the City Electrical Engineer, Mr. J. E. Mitchell, our President.

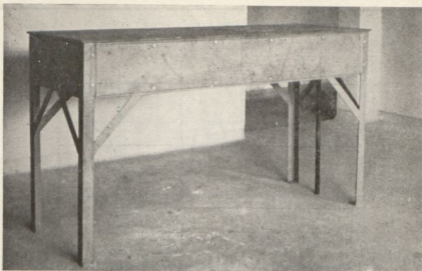
I also wish to express my appreciation of the assistance given by members of the staff of the various sections of the Electricity Department in providing much of the factual information upon which the opinions expressed in the paper have been based.



PHOTOGRAPH No. 9.
Group of hostel blocks in Harari Native Township.



PHOTOGRAPH No. 10.
Semi-detached pair of Native houses showing provision for
consumer service unit.



PHOTOGRAPH No. 11.
12 kW. communal cooking tables as installed in hostel blocks
at Harari Native Township.

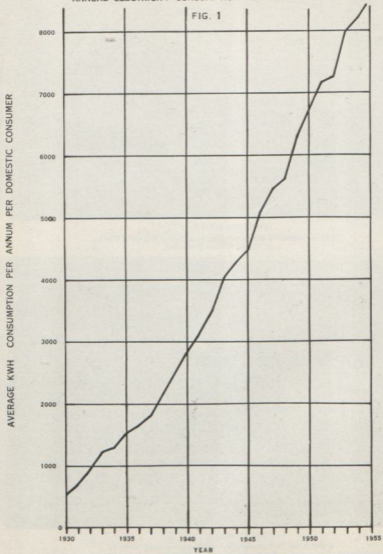


PHOTOGRAPH No. 12.
6 kW. soup boilers installed in kitchen serving meals to
children in Native Township.

SALISBURY ELECTRICITY UNDERTAKING

ANNUAL ELECTRICITY CONSUMPTION PER DOMESTIC CONSUMER

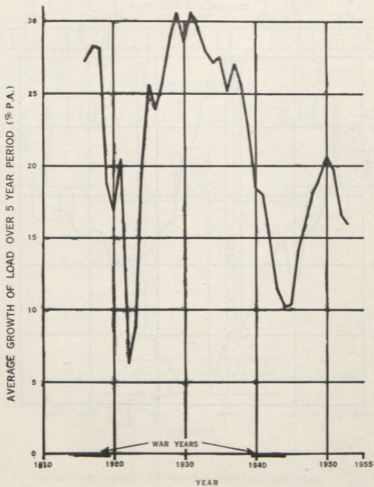
FIG. 1



SALISBURY ELECTRICITY UNDERTAKING

RATE OF GROWTH OF LOAD

FIG. 2



SALISBURY ELECTRICITY UNDERTAKING

REVENUE PER UNIT SOLD

FIG. 3

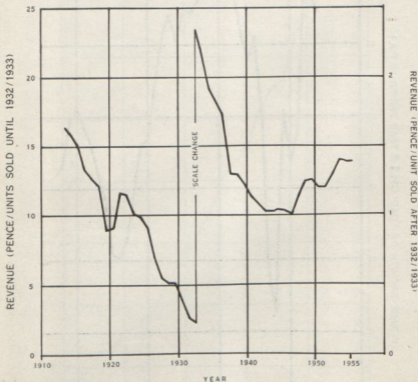
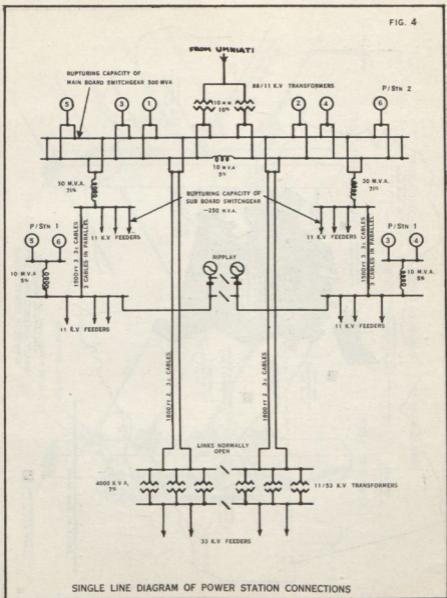


FIG. 4



SINGLE LINE DIAGRAM OF POWER STATION CONNECTIONS

FIG. 5

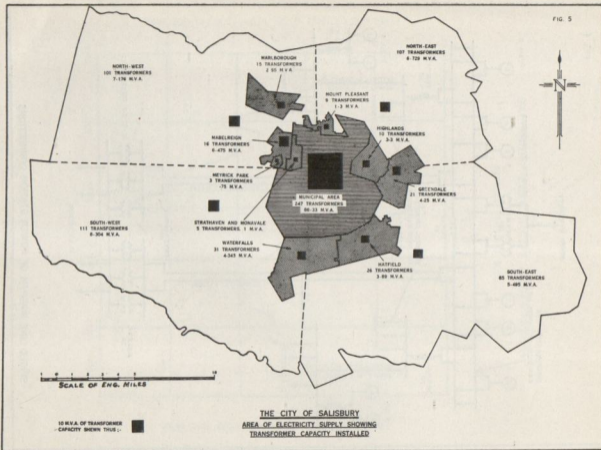
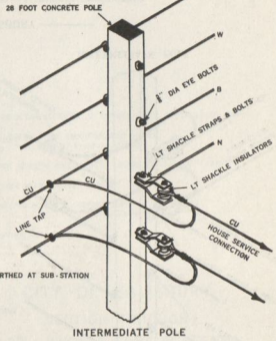
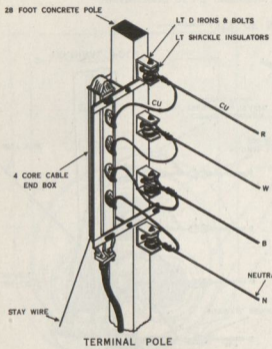


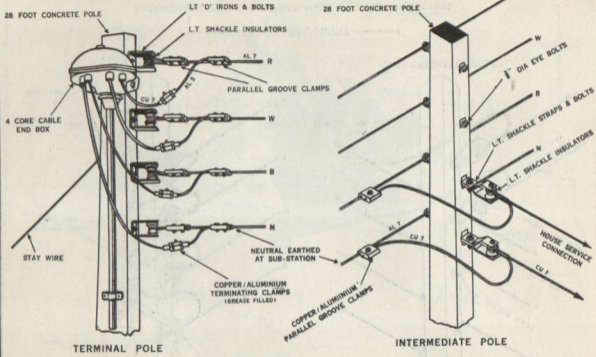
FIG. 6



— CITY OF SALISBURY —

ARRANGEMENT OF L.T. OVERHEAD MAINS—COPPER CONDUCTORS

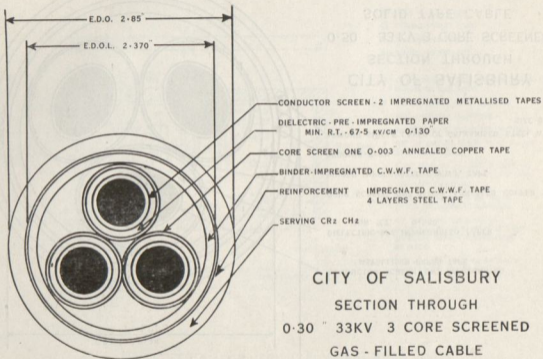
FIG 7



CITY OF SALISBURY

ARRANGEMENT OF L.T. OVERHEAD MAINS—ALUMINIUM CONDUCTORS

FIG. 8



CITY OF SALISBURY

SECTION THROUGH

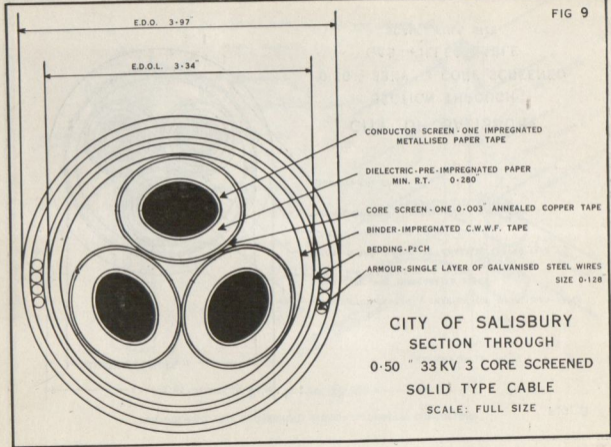
0.30" 33KV 3 CORE SCREENED

GAS - FILLED CABLE

SCALE: FULL SIZE

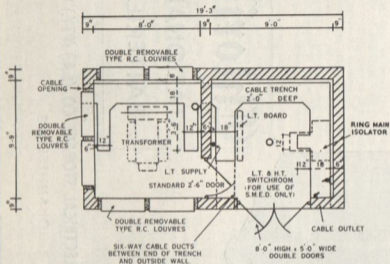
FIG 9

114



CITY OF SALISBURY
SECTION THROUGH
0.50 " 33 KV 3 CORE SCREENED
SOLID TYPE CABLE
SCALE: FULL SIZE

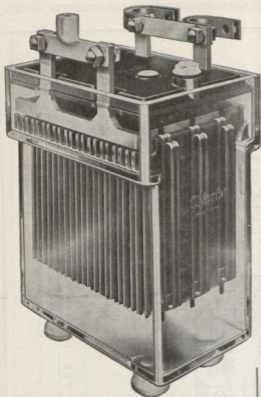
FIG 10



- ◻ WALL OUTLET LIGHT.
- CEILING OUTLET LIGHT.
- ▼ ONE-WAY SWITCH OUTLET.
- ◻ SWITCH SOCKET OUTLET.

- 6" CONCRETE FLOOR. SMOOTH GRAND FINISH CONCRETE SLAB ROOF.
- CEILING HEIGHT 12'-0" MINIMUM.
- WALLS CEMENT PLASTERED.
- AIR BRICKS TO BE VERMIN-PROOFED
- TOP OF LOUVRE BASES TO BE FLUSH WITH FLOOR LEVEL.
- 9'-3" SLOT TO BE LEFT 3" DEEP IN FLOOR BEHIND LOUVRE CENTRE STILE FOR EASY REMOVAL.
- MOSQUITO GAUZE FRAME TO BE FITTED ON INSIDE OF LOUVRES.
- ALL BUILDING PLANS TO BE SUBMITTED TO CITY ARCHITECT FOR APPROVAL BEFORE COMMENCEMENT OF WORK.
- R.C. LOUVRES MUST BE OBTAINED FROM S.M.E.D. ON RECHARGE

SUBSTATION FOR PRIVATE CONSUMERS



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APPENDIX A

CITY OF SALISBURY ELECTRICITY UNDERTAKING.

Tariff for the Supply of Electricity to Private Residences.

(a) Before obtaining supply at the lower rates specified in (b), (c) and (d) following, the consumer shall use a quota of units per month at the rate of 6d. per unit. The quota shall be based on six units per room per month.

In assessing the quota :—

- (i) The minimum number of rooms shall be three and the maximum seven, in the case of single dwelling houses.
- (ii) In the case of residential flats or blocks of buildings, one portion of which is given over to living rooms, the maximum number of rooms in assessing the quota shall be the full number of rooms in the building occupied as private living rooms, to which supply is given through any one set of metering equipment.
- (iii) Any and every room in any one residence or building, whether used as a living room or not, and whether wired for the use of electrical energy or not, shall, for the purpose of arriving at the total number of rooms be included in the total.
- (iv) Any garage, coach-house, stable, out-building, shed or other structure which is wired for the use of electrical energy, whether attached to or separate from the residence, shall be considered as a room in arriving at the total, for purposes of basing the quota.
- (v) Sleeping porches which are wired for the use of electricity and are totally enclosed, so as to permit of their use as a living room, shall be considered as such for the purpose of arriving at the quota.
- (vi) The term "room" shall be considered to mean a living room and does not include kitchens, pantries, bathrooms, conveniences, or any garage, coach-house, stable, shed, out-building or other structure which is completely detached from the residence, and is not wired for the use of electrical energy.
- (vii) Where a building is sub-divided into more than one residential portion, each of which has a separate entrance, the number of rooms in each sub-divided residential portion, is counted in the same way as for individual residences, provided the installation is arranged in accordance with the electricity regulations in force in Salisbury, to permit of separate metering for each section.
- (viii) Where a portion of a private residence is occupied by paying guests, such residence will be classed as a private residence, provided that in the residence as a whole the total number of rooms, as defined above, does not exceed seven.
- (ix) In the case of a small dairy or farm with the usual stables and out-buildings, the total number of rooms will be determined by adding to the number of rooms, as defined above for the private residence, the number of rooms in such out-buildings, calculated on the basis that every 1,000 sq. ft. or portion thereof of the enclosed floor area therein is counted as one room, provided such enclosed areas or rooms are wired for the use of electrical energy.
- (x) Where more than one use is put to a private residence, the higher tariff in respect of such differing uses shall apply unless the portions given over to the differing uses have been wired separately, so that the electrical energy consumed in each section can be separately metered.
- (xi) The metering, as far as possible, will be carried out at intervals of approximately one calendar month. No guarantee can be given, however, that exact intervals will be maintained. In assessing the quota, no allowance will be made should the intervals between successive readings of the metering equipment differ from a calendar month by plus or minus five days inclusive. Should the interval between successive readings of the

metering equipment be carried out in excess of this tolerance, the Council reserves the right to adjust the quota for this account.

(xii) In the case of small dairy farms and similar classes of consumer, the limitations of the quota to a maximum of seven rooms will not apply.

(b) The quota having been consumed, a further number of units per month equivalent to three times the quota detailed in (a) shall be charged at the rate of 3d. per unit.

(c) The units comprising the quota in (a) and the number set out in (b) having been

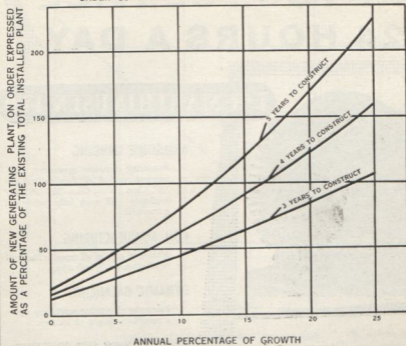
consumed, a further number of units per month, equivalent to six times the quota, shall be charged at the rate of 1½d. per unit.

(d) All further consumption during the current month will be charged at the rate of 55d. per unit, providing the consumer gives the right to the municipality to fix relays to their water heaters in order to restrict their use over peak load periods.

If this right is not given, the remainder will be charged at 1½d. per unit.

(e) A monthly charge of the quota units at 6d. will be made whether energy to this amount is consumed or not.

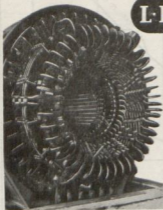
APPENDIX B

 RELATIONSHIP BETWEEN AMOUNT OF GENERATING PLANT
 UNDER CONSTRUCTION AND RATE OF GROWTH OF LOAD

 AMOUNT OF NEW GENERATING PLANT ON ORDER
 % OF TOTAL INSTALLED

Growth of Load % p.a.	3 years to Construct			4 years to Construct			5 years to Construct		
	25 yrs. Re- placement	Load Increase	Total	25 yrs. Re- placement	Load Increase	Total	25 yrs. Re- placement	Load Increase	Total
0	12	—	12	16	—	16	20	—	20
5	"	15.8	27.8	"	21.6	37.6	"	27.7	47.7
10	"	33.1	45.1	"	46.5	62.5	"	61.1	81.1
15	"	52.0	64.0	"	74.8	90.8	"	101.0	121.0
20	"	72.6	84.6	"	107.0	123.0	"	149.0	169.0
25	"	95.2	107.2	"	144.0	160.0	"	205.0	225.0

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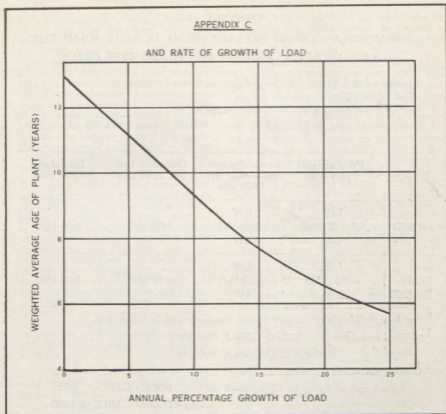
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IDEAL RELATIONSHIP BETWEEN RATE OF GROWTH OF LOAD AND WEIGHTED AVERAGE AGE OF INSTALLED PLANT IN POWER STATION

Basis of calculation for graph :-

- (a) Life of plant—25 years.
- (b) Initial peak load of 10 mW. assumed to grow at stated rate per annum over period of 10 years.
- (c) Initial installed plant comprises two 2.5 mW. sets + two 5 mW. sets.
- (d) Additional plant installed in units of 2.5 mW., 5 mW., 10 mW., 20 mW. or 30 mW. as required with at least two units of one size before capacity of new machine is changed.
- (e) Total installed capacity at any time must be sufficient to meet peak load with largest machine out of commission
- (f) Capacity of new machine not to exceed 50% of peak load in year of commissioning.

APPENDIX D

COMPARISON OF LOSSES BETWEEN 0.5 SQ. IN. 33 kV SOLID TYPE
CABLE AND 0.3 SQ. IN. 33 kV GAS FILLED TYPE CABLE

Assuming Load Factor 0.4 Load factor of losses = 0.332.

Loan Interest 7%

Sinking Fund Interest 5%. 25 YEAR PERIOD.

Resistance Copper at 20°C 0.5 sq. in. 0.05101 Ohms. per 1,000 yds.
0.3 sq. in. 0.08408 " " " "

	<i>I²R Loss per 1,000 yds.</i>	<i>Sheath Reinforce- ment Loss per 1,000 yds.</i>	<i>Dielectric Loss per 1,000 yds.</i>	<i>Total Loss 1,000 yds.</i>
SOLID	L/F 0.332 (2.0404) kW	L/F 0.332 (1.33) kW	1.05 kW	2.18 kW
GAS- FILLED	L/F 0.332 (3.36) kW	L/F 0.332 (4.7) kW	0.62 kW	3.30 kW

For Borrowdale Gates—Power Station Feeder length is 13,000 yds.

∴ Total losses are SOLID CABLE 28.4 kW.

GAS-FILLED CABLE 43.0 kW.

COST PER UNIT = 0.7d.

∴ Annual cost of losses to Department are SOLID CABLE £725

GAS-FILLED CABLE £1,100

Capitalised Cost } £8,047 SOLID.
of losses } £12,210 GAS-FILLED.

APPENDIX E
ELECTRICAL INSTALLATION — 13
AMPERE SWITCHED SOCKET
OUTLETS.

All 13 amp. socket outlets must comply with B.S.S. No. 1363, and be installed so as to comply with the City of Salisbury Electricity Supply Regulations and connected in accordance with the following:

- (a) A final sub-circuit having conductors of not less than 0.0045 sq. in. cross-sectional area (7/029 in.) (or 0.003 sq. in. in the case of mineral-insulated

metal-sheathed cable) and protected by a fuse having a current rating not exceeding 20 amperes may serve two socket-outlets each of 13 ampere rating.

- (b) A final sub-circuit having conductors of not less than 0.007 sq. in. cross-sectional area (7/036 in.) (or 0.0045 sq. in. in the case of mineral-insulated metal-sheathed cable) and protected by a fuse having current rating not exceeding 30 amperes may serve not more than four socket-outlets each of 13 ampere rating.

- (c) A final sub-circuit having conductors of not less than 0.0045 sq. in. cross-sectional area (7/029 in.) (or 0.003 sq. in. in the case of mineral-insulated metal-sheathed cables) in the form of a ring both ends of which are brought into the terminal of a fuse having a rating not exceeding 30 amperes may serve not more than ten socket-outlets of 13 ampere rating, provided that in small houses or residential flats having a floor area not exceeding 1,000 sq. ft. the number of such socket-outlets served by such ring circuit shall not be restricted.
- (d) It is permissible to take spurs from such a ring-circuit as is described in (c) above to outlying socket-outlets without intermediate fusing, provided that the branch conductors are not of smaller cross-sectional area than those forming the ring, that each spur does not serve more than two such socket-outlets, that the aggregate number of socket-outlets served by spurs from any individual ring-circuit does not exceed the number served directly by the ring-circuit and that the maximum number of socket-outlets served by any such ring-circuit and associated spurs together does not exceed that permitted in (c) above.

Careful attention should always be given to using the correct size and type of fuse in the plug, for e.g. :—

Lighting —3 amp. cartridge fuse.
Radios

Iron, Toaster,
Radiators (small) —7 amp. cartridge fuse.
Kettles (small)

Radiators (large)
Kettles (large) —13 amp. cartridge fuse.

THE PRESIDENT: Well, thank you very much, Mr. Lynch, I think we will actually break for tea before we have the proposers and the seconds.

10.30—Refreshment Interval.

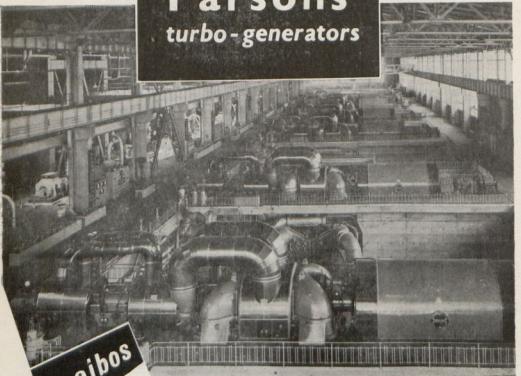
11.00 a.m.—Convention Resumes.

THE PRESIDENT: I am now going to call upon Mr. Chris Downie to propose a vote of thanks for the reading of the last paper.

Mr. C. G. DOWNIE (Cape Town): Mr. President and Gentlemen, you usually find that there is some co-relation between the person who is selected to perform the very pleasant duty of proposing a vote of thanks, or opening a discussion, and the person who reads the paper or the subject of the paper and so on. Now in my particular case I imagine that the co-relation, and the fact that I have been selected to perform this duty, arises from the fact that I happen to be an ex-resident of the city of Salisbury, before it had a public supply of electricity (laughter), I happened to spend five years, from 1912 to 1916, at what was then the Boys High School of Salisbury. You could almost say that the seeds of an early education have now blossomed forth into the person who occupies the post of City Electrical Engineer of Cape Town. (Laughter.)

I remember those days very well too. At the Boys High School I wasn't particularly bright, and I remember in Standard Seven, on this side of the classroom there was a row of "duds" and I happened to be one of them. The schoolmaster, a fellow by the name of Mackenzie, always looked on that side, he never looked at this side. If there was any trouble over this side he would pick up a great big cap and sling it across the lad who was making mischief on this side. (Laughter.) Those were the pioneering days.

I can tell you, Mr. President, that it has given me a great thrill to come back to Salisbury after an absence of 33 years, and I actually stopped living here in 1916. I remember very well when there was no public electricity supply, it was all candles and paraffin lamps and so on. The school boarding house at the Boys High School here, had a little lighting set, a little oil engine driven DC generator, and we had electric light in the boarding house. I remember the fellow, the man who used to start this little engine up every evening, the caretaker of the place, he also happened to be our boxing instructor and believe me the Boys High School, Salisbury, turned out some very fine boxers in those days. I



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remember when the first Power Station was set up in the Park here. The oil engine driven sets alongside the swimming bath, and how the swimming bath water was kept nice and warm by these Diesel engines! I remember the then Town Electrical Engineer, but I remember his daughters better than him. (Laughter.)

A paper such as this, Gentlemen, gives one an opportunity to compare notes. We have just listened to the amazing things that have been done in Salisbury, in the way they have developed their electricity supplies, their Power Stations, their transmission and distribution system, and it is a credit to the City Electrical Engineers of this City, the way they have kept pace. They have had extreme difficulties and it is really remarkable to have been told today how they have managed to keep pace with the demand.

There happens to be, between Salisbury and Cape Town, one or two things that seem to be rather familiar, and what I am going to do now is to read some things that have been prepared by the boys of the Cape Town Electrical Department, they were very interested to read this paper. I will now proceed to read what they say.

"Cape Town load, like that of the Salisbury Undertaking, is predominantly domestic, in fact the midday peak on a Sunday in the winter which results almost entirely from cooking, water heaters, space heaters and other domestic appliances, is almost equal to the system peak which carries during the week the Salisbury system peak of equal to one in the middle of winter. This year it will be about 180 thousand kilowatts, and on a cold Sunday morning just before lunch it will probably be about 180 thousand kilowatts also. Another peculiarity of the shape of the load in Cape Town, I don't know whether it is the same here, is that whereas we have a breakfast peak and a lunch peak and the evening supper peak, on a Sunday it goes straight up to lunch time. We only have a lunch peak; there is no breakfast peak. (Laughter.)

The figure of 9,000 units used per annum per each domestic consumer in Salisbury is certainly very high. It is really amazing the corresponding figure in Cape Town is approximately 5,400 per consumer.

Rising Capital Costs and Growth of Demand.

The necessity for exploring every means for reducing capital costs of power stations and distribution equipment, if the increase in the price of the electricity supply to the consumer is to be kept to a minimum, must always be foremost in the minds of supply engineers and the difficulties with which Salisbury is faced as a result of its sustained rapidly increasing demands are fully appreciated.

The advantages to be derived from extending the life of old generating plant to its maximum possible extent must be very carefully considered under present circumstances. In Cape Town we are retaining old generating plant for peak load services, which, at pre-war prices for new plant, would have been scrapped some years ago. By so doing it is estimated that we in Cape Town will be saving about £100,000 per annum in capital charges, which would otherwise result in having to purchase new plant to replace the existing old plant. I was very interested to see how the capital cost of Salisbury No. 2 station finally planned out at a figure of £56 10s. 0d. per kW. You may be interested to know that our Table Bay Power Station in Cape Town which will be completed next year with the installation of the 10th boiler will have planned out at £25 0s. 0d. per kilowatt. A new power station in Cape Town went into commission last year which will cost a total of 10½ million pounds for 120 thousand kilowatts, which works out at £86 0s. 0d. per kilowatt. This just gives you some idea of how the cost of power station plant has increased over a period of about 15 years. In the one case you have a power station completed at a cost of £25 0s. 0d. per kW, and our new power station down there £86 0s. 0d. per kW. Our proposed new power station, the tenders for which were advertised in the newspapers yesterday, will pan out at about £90 0s. 0d. per kW. This is for the first stage.

Salisbury No. 3 Power Station.

It was very interesting to see that pulverised fuel firing is to be adopted for the No. 3. power station. We also considered for our new power station at Cape Town

the adoption of pulverised fuel, but because the station is going to be alongside a garden city we decided to start off with stoker fired boiler units. One of the things that rather worried us about pulverised fuel fired boilers was the disposal of the fly ash and it will be rather interesting to hear from Mr. Lynch how they are actually going to dispose of their fly ash.

Distribution and Consumers Installations—New Townships.

The difficulties encountered in providing electricity services at an economical cost to new townships where the sale of plots is not restricted to one section which must be built up before other sections are developed have, of course, been met in Cape Town. But here township proprietors are required to give a guarantee acceptable to the City Treasurer, that electricity equal in value to 20% of the cost involved in the provisions of supply mains will be consumed or paid for at the standard tariff for a period of five years.

In certain outside areas situated at excessive distances from the source of supply or service depots this guarantee is increased to 33% of the cost of supply mains, and, in the case of one large township where plots of a minimum of two acres are provided, the estate proprietors were required to bear the entire cost of the supply mains and transformer involved on the understanding that, when the revenue from the consumption of electricity in the estate equalled 20% per annum of this cost, the council would take over the mains, etc., at a depreciated value.

Reinforced Concrete Poles.

Reinforced concrete poles manufactured by the spinning process have been used on the Cape Town distribution system for some years and have in general been found very satisfactory. Thirty-foot poles now cost approximately £9 0s. 0d. as against approximately £21 0s. 0d. for a corresponding galvanised steel pole. The erection costs of a concrete pole, however, are some three times as high as for a steel pole, and the handling and transportation of poles to site is not so easy as for steel poles in that concrete poles weigh approximately 1,200 lbs. as against 400 lbs. for the steel

pole. Furthermore, due to weakness in torsionary strength we confine the use of concrete poles to boundary line construction, and do not use them on street boundaries where there is a danger of being hit by traffic, as experience has shown that if one conductor breaks the unbalanced strain on the adjacent poles is sufficient to cause them to break in torsion. That difficulty could be overcome by laying the conductors in the horizontal plane. We actually use quite a lot of wood poles and in most cases we do range the conductors in a horizontal plane as you have probably seen in Salisbury recently.

Aluminium Conductors.

We at present are using aluminium conductors for a trial in one small housing scheme, about half the service connections are being made in PVC insulated aluminium and the remainder in PVC copper. The consumers lead-in is PVC copper conductor, in all cases. The object of this is to check the effectiveness of the aluminium to copper clamp, where copper service connections are used, and the aluminium copper connector where aluminium service connections are employed. No data is, of course, as yet available, regarding the effects of corrosion. I am, however, in agreement that the overall saving to be effected by using aluminium is not likely to exceed 8%.

Gas-filled Cable.

Gas-filled cable has also recently been put into service in Cape Town, the largest installation of which comprises 2.5 square inch 66 kV. cables, each of which have a capacity of 60 mVA. made of a route length of approximately 6.5 miles. These cables are at present operating at a pressure of 33 kV. and they will continue to be used at this pressure until a new power station has been put into commission. They will then be looped into the Power Station to provide four 60 mVA. out-going feeders operating at a pressure of 66 kV.

Apart from the fact that particular care was exercised in the laying of these cables to ensure that the protective sheathing was not damaged, no particular difficulty was encountered in this work, and with the very limited experience we have so far had there is no reason to doubt that this type

of cable will not prove satisfactory in service. We actually did all the cable laying ourselves.

Ripplay Control.

In Cape Town we are at present installing what is in the nature of an experimental ripplay control equipment, which consists of an injection plant which injects high frequency ripple into the 12 kV. system supplied from a main step-down substation where 30 mVA. transformer capacity does the stepping down from 33 to 12 kV. This main substation is one of nine, each of which supplies self-contained 12 kV. supplies. When complete the ripple installation will contain approximately 5,000 relays and tests so far carried out indicate that between 50% to 60% of the connected water heating load is kept off when the control equipment is operated to disconnect this load for an hour. It must be recognised, however, that an artificial peak may be created at the time of restoration of the load, which will necessitate its restoration in steps by the use of multi channel relays. The data which we have already been able to collect from these experimental installations is rather inconclusive. We are hoping to have more relays installed by the end of the winter and get something more definite. What we do know is that our total connected water heater load, there are about 50,000 water heaters altogether, works out at about 1.34 kilowatts per water heater, and we also know that we can cut off about 33% of that load during the peak period. Mr. President, and Gentlemen, that is enough to say about this paper, and in conclusion in presenting this vote of thanks I want to heartily congratulate Mr. Lynch for having given us this valuable paper. There is a lot in it that we can learn and it also should stimulate quite a lot of discussion. As I said before, it gives us the opportunity to compare notes and I hope that it does rouse some discussion, for you, Mr. President, I want to say again what a thrill it has been to come to Salisbury and to see this vast change and to congratulate you on the fine undertaking you have built up in this old City that I used to belong to. Thank you very much. (Applause.)

THE PRESIDENT: Thank you very much Mr. Downie and also for your very kind words. We have always considered that Mr. Downie was part of Salisbury, and one of these days we may incorporate Cape Town with him. (Laughter.) I will now call upon Mr. van der Walt to second that vote of thanks.

Mr. VAN DER WALT (Krugersdorp): Mr. President, Gentlemen, Mr. Lynch's paper is the type of paper that suits the purpose of this convention to a "T". He has catered, and very masterfully at that, for nearly all sections of a municipal electricity undertaking. It is the type of paper we literally lap up. He tells us what they do in Salisbury. We either think its good and say nothing or we disagree with Salisbury's policy and we will tell them so.

The generation section I will leave to the larger undertakings who generate their own electricity, or as the little street urchin said: "to my big brother what smokes". (Laughter.)

I found the distribution section and consumers section of particular interest.

L.T. Reticulation :

Your method of mid block distribution is certainly a good one, and something I have advocated before. But does Salisbury economise in this way? Your service connections are more economical but surely this is an economy to the consumer alone—or are service connections given free? On the Reef, consumers pay for service connections.

If your consumers pay for service connections, do you economise, seeing that street lighting has still to be installed. I note that this is done in underground cable. If economy was aimed at would the S.A. conventional system of overhead lines along one side of the street, carrying street lighting as well, not have been the better answer?

Townships :

My Council usually stipulates that in their own townships, building must take place within two years. I have yet to learn of legal steps being taken if this is not complied with. An extension of time is very readily obtained.

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We do control the townships by zoning. The second zone is not opened up for sale unless 25% of the first zone is built upon, etc.

With private townships, an agreement is entered into. The company lends the Council the capital required. This capital is repayable on an empirical formula for payability, i.e.:

Refund = $5 \times$ revenue received per annum
less any previous refunds less
5% depreciation on capital not
refunded.

The zoning and 25% "built upon" clause is also brought into operation. This ensures that the company develops the township on economical lines AND IT WORKS. Development is of course not so rapid as is here, but then repayments are small.

Legislation to force building within a period will assist whilst the demand for building plots exceed the demand. But during normal times it may retard development.

Regarding the author's remarks on aluminium wire construction, I am of the opinion that the special fittings bogey, is overstressed by the manufacturers and suppliers, particularly in our drier areas.

A short aluminium line was dismantled in Krugersdorp after being in service for approximately 20 years. No special precautions were taken during construction. Crosby clips, copper and brass line taps and copper wire service tap-offs were used. There was not the slightest indication of corrosion. I have so much confidence in this finding, that a new township of approximately 400 stands was recently reticulated with stranded aluminium wire on concrete poles, without any special fittings whatsoever.

I do not understand the author's assessment of increased labour cost for aluminium wire. I find that it is less. I am therefore of the opinion that the cost ratio of copper to aluminium in this case should be +/- £550/£425.

The difficulty in appropriating substation costs in building is something most of us experience. Pretoria once had a scheme in mind to pay the owner the cost of the substation, and then charge each consumer,

supplied from this substation, an assessed substation rental fee, based on demand. I wonder whether this was ever put into operation, and if so, is it satisfactory?

The data and comparison tables for various types of transformers, I find interesting and a very useful future reference.

I am glad to hear that Salisbury also favours single phase to three-phase supply for consumers. In Krugersdorp the saving in purchase of new meters has been of some importance. But how did the department convince the consumers that the same power at the same rate could be supplied by single phase !!! I am usually told by consumers being changed over, that they will now have to pay three times as much, or will only receive $\frac{1}{2}$ the power!

The supply of electricity to Natives and Native housing schemes, is a question which will at some time or other affect most of us. I think all of us can expect a large increase in sales of electricity to Native townships due to higher standards of living being progressively attained.

It is not clear from the author's paper how the overhead mains are designed. Will they cater for the expected future increase in load, when tenants are prepared to pay for the service, or will the overhead lines be reconstructed as the load grows?

Does the author not find that illegal installations are made to the lighting installations, by means of adaptors, flex and what have you to enable consumers to plug in irons, hot plates, etc.? This was the experience of Krugersdorp. Especially ironing was the major contravention to supplement the family income. Miniature circuit breakers cured this malpractice, but even these were interfered with. The lines were reconstructed, and all houses are now individually metered.

As we are now on the Native question Mr. President, you will pardon me if I bring in a little politics with this story:—

An Indian wishing to immigrate from India to South Africa, was told by his countrymen that apartheid was something to be feared, and he should reconsider his decision. They made him to understand that blood even flowed over this apartheid question.

In spite of all these warnings, the Indian took the first boat to South Africa.

Upon landing at Durban, he saw an Indian chewing betel nuts, and the red juice dripping onto his white tunic. Thinking that this was blood, due to his countryman having been assaulted in connection with apartheid, he went up to him, pointing at the supposed to-be blood, and asked: "haparteit haparteit! !"

His countryman looked at his watch and said, "Na—ha part nine!" (Laughter.)

I have much pleasure in seconding Mr. Downie's vote of thanks to Mr. Lynch for this fine paper. I enjoyed and appreciated it very much indeed.

Your initiative in all fields is to be highly recommended. Thank you.

THE PRESIDENT: Thank you Mr. van der Walt. It is very nice to sit in this chair here and listen to the comments on my own undertaking without having to reply to them. (Laughter.)

Now unfortunately it is getting too close to half past twelve and we have one or two items that we want to do before half past twelve, so I am going to give twenty minutes for discussion on this paper, when I must adjourn that discussion while I put forward one or two items. So the paper is now open to discussion for twenty minutes.

Mr. SIBSON (Bulawayo): Mr. President, and Gentlemen. Members will know how often I have commended the reading of papers of this sort. I think a paper on an undertaking, particularly on the undertaking in the town in which the Convention is held is always of tremendous value, and this one comes up to our best expectations. I do want to first of all congratulate Mr. Lynch on the very able way in which the paper has been put together, and the equally able way in which he presented it to us this morning.

I want to make a few comments about one or two points that are made in the paper, and perhaps the first one, although it is not in logical order, might be a reference to the domestic supply of electricity and in particular the tariff that is employed. The tariff that is being employed in Salisbury is a little unusual. It is based

on the room tariff as you see, but it provides for a very much larger initial quota at the higher rates than is usual. That enables the undertaking to reduce the ultimate rate to a lower figure than is usual. Now if we examine that tariff in relation, shall we say, to a house with five rooms using something like 600 units per month, we find how extremely logical it is. The .55 as the low rate bears its popular relation to the running costs of supply which I think will probably be round about .5, it won't be very much different to that. If one was to apply a figure of .55 to the 600 hypothetical units being used by the five roomed house we find that the balance of the money that the consumer would have to pay amounts to a sum of £2 2s. 6d. (I have worked it out roughly), which represents the standing charges for that supply. Now I don't know the standing costs of supply in Salisbury, but in Bulawayo the standing charges for 3 kW. demand would amount to about £2 16s. 0d. per month, so that £2 2s. 6d. as a standing charge seems to be a very logical and reasonable amount, and I doubt if there are any undertakings that are producing so accurate a result through their domestic tariff as that.

On the other hand there can be no doubt that sort of tariff is one that will encourage the use of more and more electricity. There are very few houses nowadays that don't use the quota, even the high quota that is involved in the Salisbury tariff, and so, in this case with a very low ultimate rate, the incentive to use more electricity must be greater in Salisbury than anywhere else. I think perhaps that is reflected in the figures of consumption per domestic consumer that have been given in this paper, 9,000 units per year is a very large figure indeed. We have heard the figure for Cape Town and in Bulawayo where I think, broadly speaking it is much the same sort of population they came from the same place, more or less just as recently, the amount is round about 8,000 per year and I think it may be that this difference in tariff has something to do with that difference.

What I want to question is whether in a country like this where so much of the control of electrical appliances is in the hands of the other partners in this country

of ours, whether it is really a good thing almost to encourage waste. From the point of view of the supply of electricity provided he has got ample facilities, there is no doubt that the higher consumption, the bigger the revenue the better. But in the long run I wonder whether it is a good thing in any country for waste to be encouraged, and I do not think there is any doubt that a good deal of this 9,000 and in our case 8,000 units per annum used in the home is wasted. For that reason I think perhaps one ought to think very carefully about what we call "promotional tariffs" as far as domestic supplies are concerned.

Now the economies that have been effected on the generation side of the Salisbury undertaking are shown very clearly in the capital costs per kW. installed, which are very impressive. Mr. Downie made my hair rise momentarily when he spoke about £25 0s. 0d. per kW., but I remembered that the bulk of that was pre-war. Just to make a comparison, we have managed in this case to do just a little better in Bulawayo, our cost for the 13th Avenue Station which is a little later than the Salisbury No. 2 is coming out at £49 2s. 0d. per kW. Before you compare that with the Salisbury figure of £56 5s. 7d. remember that we do not include in that figure interest during construction. If the amount is deducted from the Salisbury figure, theirs becomes £53 6s. 0d.

That is very impressive, Gentlemen, and there is no doubt that Salisbury has been able to, on their generation side, to make a great contribution to economies. Unfortunately the paper does not include similar details in regard to the distribution system. There is no figure for overall cost given regarding that, but I have taken the opportunity of studying the tables that appear in the Municipal Year Book. I know these tables are very often subject to considerable criticism, but, on the assumption that the figures quoted on these tables are correct, we get some very interesting results if we compare various undertakings distribution costs with the number of units that are sold.

Before I read these figures out you must remember that there are wide differences

that exist between different towns. A town that has a big rural distribution system is bound to have a high cost per unit sold, and those towns which are situated in places where underground cables are needed rather than overhead are also bound to have a higher cost. Bearing these variations in mind, these are interesting figures taken from the last Municipal Year Book. Port Elizabeth appears to be the most economical, and has to spend, or did spend up to the end of 1954—£6,210 for each million units sold; the next is Durban who have spent £8,350 for each million units; and then we have Cape Town with £8,750; Bloemfontein next with £9,140; Bulawayo which spent £10,000 per million units; Johannesburg spent £10,200; Pretoria spent £12,400; East London spent £12,660.

It was therefore a bit of a shock to find Salisbury's figure £17,500 per million units sold. Now it may be that the figures in the tables, as I said just now, are not correct, but if this figure is right, in spite of the considerable rural area which Salisbury has to serve it would be interesting to get some reason for that wide divergence.

Mr. Lynch appears to have had a very unhappy time with his chain grate stokers, from what he says in his paper. I don't know if all of us can subscribe to the statement that the most vulnerable part of the boiler is this stoker. Certainly it is not my experience, and, generally speaking, I think I can say that we have found the chain grate stoker a most reliable piece of equipment: it seldom gives any trouble.

Just one more point in the matter of substations on private property, I will just tell you that in Bulawayo the method we adopt to recompense the owner of a building who has made space available is first of all to charge him no connection fee, that is on the understanding (in fact it is a contractual agreement) that the substation is to be available for supplies to other consumers as well, although it may not necessarily be used for that initially. The owner pays no connection fee and further he gets all the supplies that are needed for the common lighting of passages and things of that sort which would normally be charged at the lighting rate, which is a fairly high one. He gets this at an especially reduced rate and we have found



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that in general the owners are very satisfied with that arrangement. In fact we have had some owners complaining that we have not selected them as the supplier of the substation in preference to their neighbour.

And just one more final small point, I endorse what Mr. Lynch says about the problem associated with 13 amp. ring main plugs. We have not ourselves agreed to adopt them. We have felt that there are certain dangers, again in those homes administered in the manner that I have previously described. There are dangers that the wrong sort of measures might be taken for restoring supply. Thank you, Mr. President. (Applause.)

THE PRESIDENT: Thank you, Mr. Sibson.

Mr. LOMBARD (Germiston): Mr. President, Gentlemen, I think that we all agree that Mr. Lynch has presented us with an extremely interesting and stimulating paper. The paper contains a comprehensive survey of many of the important activities of the Salisbury Electricity Department and it is quite evident that a lot of thought has gone into many of the schemes mentioned herein in order to obtain the utmost economy of capital requirements, and I am very pleased that this aspect has been stressed. The Salisbury Electricity Department is apparently making an all out effort to collect as many consumers as possible, and I am amazed by the statement that new installations are connected at the rate of 250 per month. In this connection I would like to ask the Author whether a block of flats is counted as one installation.

Referring to the Author's remarks in connection with the use of aluminium in place of copper conductors, it would appear that the price of copper quoted in the table of figures is rather out of date and that the comparison of copper versus aluminium construction is not a true reflection of present day conditions. There has also been a considerable reduction in the price of ore aluminium and copper to aluminium fittings which are now manufactured in the Union, and there is, therefore, no longer such a large discrepancy between the cost for fittings for copper and aluminium lines. I may also mention

that PVC weather-proof twin aluminium wire for overhead service connections has now appeared on the market. By using this wire for service connections from aluminium lines the necessity of using copper to aluminium for take offs does not exist. I may mention that in Germiston during the last year we have used aluminium conductor extensively and the overall saving has been of the order of about 30%.

I was interested in the Author's remarks in regard to the substation requirements in commercial and flat development areas. The procedure adopted in Salisbury appears to be as in many other centres that if the demand exceeds a certain value, the consumer is required to provide suitable accommodation to house the Council's transformation and other equipment, and the problem in connection with a dissatisfied owner, the first to appear on the scene, and who was therefore saddled with the cost for providing accommodation for a communal substation, is the same too. It is noted that in accordance with the Salisbury tariff a fixed fee of £10 0s. 0d. is charged for a low tension connection plus £5 0s. 0d. per meter for each extra consumer, regardless of whether a substation is installed or not. I submit that a tariff based on the actual cost of material and labour required to provide a service connection would be more equitable, and would tend to pacify a dissatisfied owner who has had to provide accommodation for the substation equipment, as his connection would be comparatively short, and he would consequently be required to pay less than his neighbour who is supplied from the same substation, and whose connection would be longer.

The Author mentions the use that is being made of air cooled transformers with Class B or Class A installation in substations where the explosion of the transformer may cause extensive damage, and where the owners of buildings are faced with demands to provide automatic fire extinguisher equipment. Air-cooled transformers are of course coming into extensive use overseas, particularly in the U.S.A., but it is noted in Table No. 4 that the price of an air-cooled transformer with Class B or Class H installation is roughly

twice that of a standard oil cooled transformer of the same capacity. In view of the enormous difference in price one wonders if there is not other equally satisfactory but less costly way of overcoming this problem; and I would like to ask the Author whether consideration has been given to the use of standard transformers filled with a non-inflammable cooling medium such as Pyrenol.

Alternatively I am reasonably sure that the Insurance Companies would be satisfied if the design of the transformer chamber is such that the risk of fire spreading to the rest of the building is eliminated. This can be done by providing a pebble filled oil sump, fire-proof guillotine doors operated from fuseable links arranged so that all ventilation openings which are in communication with the rest of the building can be closed off in the event of a fire, etc. The extra cost of making a substation building reasonably fire-proof to prevent the spreading of a fire outside the substation would be considerably less than the additional costs that would be incurred in providing an air cooled transformer. It is rather difficult to find justification for the Author's statement that under low annual load factor conditions it would be found that a 300 kVA, air-cooled transformer can replace a 500 kVA, oil immersed unit, and one may well find that both lowest capital charges and least running costs are achieved when the smallest air-cooled transformer which is capable of meeting the annual demand without damage is used. The following data have been taken from Table No. 4:

Cost 300 kVA. Transformer	£1,134
Cost 500 kVA. Transformer	£855

No load losses—

300 kVA. Transformer	1.2 kW.
500 kVA. Transformer	1.683kW.

Mr. Wrigley's paper entitled "General Distribution Problems", which was presented to the Convention held in Bloemfontein during 1954, gave the following figures which apply to the Salisbury undertaking:

Max. Demand Charge	£5.2 per kW.
Unit charge	£.0015 per kW.

Annual depreciation and interest 7½%.
The difference in cost between 300 kVA.

air-cooled and 500 kVA. standard oil-cooled transformer is £279 0s. 0d. The difference in the annual interest and depreciation charge is therefore £20 9s. 0d. The 500 kVA. standard oil-cooled transformer will have the lower copper loss under all load conditions, but for the purpose of simplicity this will not be taken into consideration. The difference in core loss between the two transformers is .483 kW. the annual difference in cost of core losses is therefore £8.86. The annual saving of £8.86 due to the lower core loss of the 300 kVA. transformer is therefore more than off-set by the £20.9 per annum increase in interest and redemption charges.

The Author has given us some figures in regard to 3-phase and single phase service connections, the cost of a single phase connection is given as follows:

Cost of Service	£1 0 0
Cut-out	12 6
Meter	3 11 6
Total	£5 4 0

This is an extremely low figure and I would like to ask the Author whether the cost of line taps, pole service fuse and labour have been included in the £1 0s 0d. quoted as being the cost of service. It would also be interesting to know the average length of a service connection on which the comparison has been made. While I agree with the Author that costs can be lowered considerably by providing single phase instead of three phase connection, the former has several serious disadvantages, particularly in the case of overhead service connections; and it is quite likely that many undertakings will eventually go back to multi-phase connections for all electric houses. Most local authorities today provide 50 or 60 amp. single phase connections to houses where electric stoves and water heaters have been installed, and some are even thinking of providing 80 and 100 amp. service connections. The question is, whether we can afford to continue increasing the protection level in single phase services to keep up with the demand of the all electric house. Thank you, Mr. President. (Applause.)

THE PRESIDENT: Thank you Mr. Lombard. I don't want to stifle discussion and I shall ask for further discussion on this paper as the Convention proceeds, but there is one item I do want to deal with this morning and that is the alteration of the Constitution.

Before doing that though I have an apology to make. When I announced the names of the Executive yesterday I forgot a duty of mine, and that was to thank the outgoing members of the Executive that were not re-elected namely Councillor Young and Mr. Hallé, both those Gentlemen have served on the Executive for many years at various times, and it was definitely my duty to thank them on behalf of the Executive Council and on behalf of the whole of this Convention and the Association for the very sterling work they have done for us through their many years of association with us and I wish to do that now and rectify my error. (Applause.)

Now the next item I want to take, Gentlemen, is Amendments to the Constitution. First of all, as I mentioned yesterday, we have an amendment which I don't think will need any discussion at all, and that is to legalise the appointment of Mr. Burger as our Honorary Legal Adviser. The second one is in regard to regional branches: one alteration to constitution which has to be formally adopted, and I will ask Mr. Sibson to speak on that one.

Mr. SIBSON (Bulawayo): I won't keep you a moment, Mr. President, the clause that was accepted at the last Convention in respect of regional branches required that there should be a quorum of 10 persons. It has been felt that this figure is unduly high, particularly for some of the regions that may be set up, and it wasn't really the intention that there should necessarily be 10 separate undertakings represented, but, since each undertaking could have two members, a figure of 10 was said in order to make sure that one had at least five undertakings represented. But the whole thing can be easily covered by a slight alteration of the wording which will cover both points, and I propose that in respect of quorum this following amendment be made:

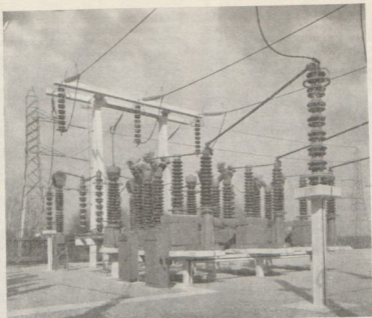
"That the quorum shall be not less than five provided that not less than five undertakings thereby are directly represented."

THE PRESIDENT: Thank you, Mr. Sibson. Are there any other speakers on that amendment to the Constitution which is really just an ordinary domestic matter? Will anybody second that proposal? Thank you, Mr. Muller. Is that agreed? Agreed.

Now the next adjustment to the Constitution is in regard to fees. As you know, the half-yearly meeting of the Executive which is held in November is attended by the members of your Executive, and some of the members of that Executive are fortunate in having Councils who I might say, are enlightened enough, to pay for their members to go to the half-yearly meeting. Some of them consider it an honour for their town to be on the Executive, and are therefore quite willing to pay; others adopt the attitude, and I think it is a very reasonable one, that as the Executive is doing work for the whole of the municipalities, the whole of the municipalities should actually contribute to their Executives' travelling expenses in doing their work for them.

This has been discussed at quite a number of Executive Councils, and, last year, it was decided that the Finance Committee should investigate what this would mean to the finances of the Association. The idea being that even for those whose Councils normally paid for their Executive that wouldn't be asked for any more, and all the Executive would be paid to go to the half-yearly meeting which of course, will be placed at the most central position. After that investigation had been made, the increase in fees which would be required to meet that were discussed and the proposal which you have before you is the result of that discussion. I am going to throw it open for discussion now to see if anybody has any comments to make on that, then I shall ask for a formal proposer and seconder from anybody in the audience. Thank you.

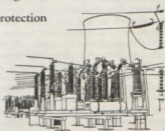
I think, for your guidance, I should tell you that the increase is really only about £2 2s. 0d. until you get to the last five or six larger undertakings, but the remainder is only really an increase of £2 2s. 0d.



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per undertaking. Can I have a proposal from a Delegate please?

Cr. R. L. DE LANGE (East London):

Mr. President, I am quite happy about this proposal about the increased fees. After all, if you want to have the privilege of your representative to be there, and you have the benefit of the organisation, I think you should be prepared to pay. I feel that most probably the majority of the Councillors present would have no objection to that increase. First of all I would formally like to move that proposal, Mr. President.

THE PRESIDENT: Thank you Mr. de Lange. I will give you a further opportunity later. May I have a seconder please? Thank you, Mr. Miller. Is it agreed then, Gentlemen that the Scale of Contributions be increased as follows:

Up to $\frac{1}{2}$ million kWh. sold 6 guineas;
Over $\frac{1}{2}$ to $\frac{1}{2}$ million kWh. sold 8 guineas;
Over $\frac{1}{2}$ to 1 million kWh. sold 10 guineas;
Over 1 to 5 million kWh. sold 12 guineas;
Over 25 to 125 million kWh. sold 16 guineas;
Over 5 to 25 million kWh. sold 14 guineas;
Over 125 to 500 million kWh. sold 20 guineas; Over 500 to 1,000 million kWh. sold 25 guineas; Over 1,000 million kWh. sold 30 guineas.

Anybody against? Thank you. Carried.

I understand that there are delegates who wish to put forward suggestions for further alterations to the Constitution, and I will call for those now.

Cr. R. L. DE LANGE (East London): Meneer die President, ek hou lange meer van die langwors 'n kort spreek.

But, Mr. President, and Gentlemen, may I say that I feel in my humble opinion that the time has arrived that there should be some change in the Constitution of this organisation. Mr. President what I am going to say, I would like you to feel is not being said in any spirit of animosity, not because the Engineer of East London has not been elected to the Executive, but because in my humble opinion I feel, Sir, it would be in the interests of the organisation. Mr. President, I feel that there should be a bigger representation of the smaller municipalities. It is all very well for the large municipalities, such as Cape Town, Johannesburg, Pretoria to get

together to be in an executive position, but I sometimes feel that the people who are and will need the guidance of the organisation are the engineers and the Councillors of these smaller towns, Mr. President, I do not want to make any comparisons, and may I say I do not want my friends in the Transvaal to feel that we are sore because they have more representatives than any other municipality, but when you take, Mr. President, for instance the Cape, you have more or less approximate figures, 13 municipalities with 20 representatives, you have one representative—Cape Town.

In the Transvaal you have 24 municipalities with 48 representatives: you have seven members on the executive: Orange Free State: nine municipalities with 13 members, one representative; Natal: four municipalities, eight members; Rhodesia with seven municipalities, 15 members, two representatives. and we are very happy now to see South West Africa is represented with Windhoek.

Mr. President, I feel sure that it is here where the Association should agree to enlarge the executive. Mr. President, it may be said that it is going to be too bulky or that it is going to be too expensive as I said earlier in moving the resolution for increasing the fees. If you want service, Mr. President, you must be prepared to pay for it, and if the municipality is not prepared to allow its councillor or its engineer to go to the Conference, or if they are not prepared to pay his fees then they should not be allowed to serve on the executive. Mr. President, finance has always been held up. I feel that if such a municipality is not prepared to pay for his councillor or his engineer, I don't know, I believe, Mr. President, I think you should tell me if I am wrong, that some of your associated members contribute towards your organisation.

Now some of these engineers from these smaller places, as I have said earlier they need your help and guidance. It is here if I can suggest, Sir, that some assistance should be given to the engineer from the smaller places to help him to come along to these conferences. Well I think this morning I heard some of the engineers of

the smaller municipalities state that the paper read by Mr. Lynch was an outstanding paper, and so far as they are concerned it was of great assistance to them.

Therefore, Mr. President, I feel, I don't know, this is just a suggestion, that these funds should be raised to assist them. The other reason is, Mr. President, that when you go through your list of municipalities represented here, and when you think from the whole Cape there are only 13, it makes me think that maybe there is something wrong. There must be something wrong. Mr. President, when I think of places like for instance, George, Stellenbosch, Burgersdorp, Queenstown, Knysna, Mossel Bay, Hermanus, Somerset West, Beaufort West, and I can go on mentioning many others.

Why are they not present, why are they not represented here?

I feel, Mr. President, that the executive should make direct contact with these people, that your executive should contact United Municipal Executive, and ask them through the United Municipal Executive that their Councillors or their Engineers should be here. Well, Mr. President knowing that electricity being the future of any country, and especially in our country, it is the whole future of our country that depends upon electricity, and the more your engineers can get together, together with your councillors, I feel it is going to be of great help and assistance.

Mr. President I don't want you to feel that I am trying to rub this in in any way at all, but I would suggest, Mr. President, that your executive consider the idea of increasing your membership from 10 to 15. Mr. President, that would give a bigger proposition. I would also like to suggest, Sir, that no member should be allowed to stay on the executive for longer than three years, because, Mr. President, I feel that is where the Municipality comes in. That if you feel that you have an engineer, but let me say that some of the smaller towns have engineers, Mr. President, who are very clever men.

Give them a chance of being represented on the executive in some way or other, it would be to the advantage to the man himself, and advantage to the city. I feel

that here we have some of our oldest engineers from some of the bigger municipalities who have been on the executive for donkeys years. I say with all due respect that they have done wonderful work, they should now be prepared to sit back and say to some of the younger fellows "now you boys, we will give you a hand and we will help you." Mr. President, let them get up there and let them give you the papers and let them assist. Therefore I would like to suggest, Mr. President, that if you had 15 members then five members should automatically retire every year, and so you will go round in a cycle. I am quite convinced, Mr. President, that if that procedure was adopted most probably the Association will have more members, and that the smaller municipalities when they realise that there is a possibility of their engineer getting that assistance, they will be prepared to come along.

Vernaamde daardie ek wil op my meerde laastewerde van die klein dorpe en stede beroep maak. Mnr. President, dat as daardie lede verteenwoordiging kry af die uitvoerenderaad sal dit gewelde baie help om daardie gevoel daar te gee dat daar iets konstruktief gedoen word op die Kongres.

Ons weet somtyds dat sommige van die lede sê "ja dat is 'n lekker keier wat 'n mens heir kom doen". Nou ja Mnr. die President, ek sal sê dat somtyds 'n Kongres is harde werk, vernaamlik as 'n mens hier sit en jy luister na 'n goeie papier en jy moet jou brein gebruik en dink wat daardie man gee dan dink jy wat jy moet doen belangrik stel dan is dit 'n bietjie werk. Nouja daardie lekker dinge wat na-kom soos gisteraand byvoorbeeld en vanmore se kopseer en vanaand se lekker dinge en more se kopseer is die moeite werd. Nouja Mnr. President dat die sal sterk, oorwee oor die uitbreiding van jou uitvoerenderaad na 15 lede waar 'n man elke jaar 5 sal aftree en die ander voorstelle. Mnr. die President ek sal u vra om dit nou 'n ernstig oorweeging te neem en ek is oortuig daarvan dit sal lee tot 'n verde uitbreiding en groote verteenwoordige op die Kongres. Baie dankie.

THE PRESIDENT: Thank you, Mr. de Lange. Before calling for a seconder, I would like to inform Councillor de

Lange as to why some of the smaller municipalities are not represented here today. As the organiser of this Convention I know the reasons for quite a number of them, that is despite actual pleading with the United Municipal Executive, despite our letters to them, they are still only allowing their representatives to attend the Convention once every two years. And quite a number of them have written and said that this is not their year, sorry they will not be coming. That is one of the reasons why some of them are not represented here.

The proposal, as I take it, is as follows: that the executive give consideration to increasing the number on the executive to 15, and that five retire every year. I would like one clarification, if I may, from you. I gathered from your remarks that once a person had been on the executive for three years he should never be re-elected. No? Just retire in rotation.

The proposal then, is that the Executive consider (I think you will have to do that because there are quite a few repercussions in regard to presidents, vice-presidents, past presidents and how they stand on the Executive) increasing the Executive to 15, five of whom shall retire each year in rotation. Can I have a seconder for that proposal? Seconded. Any discussion on that? Well, if there is no discussion on that I will put that to the vote. All those in favour.

Will you come to the microphone Mr. Fraser if you don't mind.

Mr. FRASER (Johannesburg): Mr. President, if I may, Sir, ask you that when you are considering the amendment put forward to you, would you consider the representation of each province. I found that that is more important than the number of men on the Executive. What you want is a sprinkling of individuals from each province to give the Executive a guide as to the conditions in the areas in which they operate, and I would suggest, Sir, that if the proposer would put to his amendment that a certain number from each province be elected each year.

THE PRESIDENT: Thank you, Mr. Fraser, I do not think that is actually

necessary because the Executive has already decided that an amendment to the Constitution shall be put forward with that in mind, and I actually mentioned that on the first day. So I don't think Mr. de Lange has any objection. If there is no objection, we shall actually consider that at the same time. We had all these matters in mind, but we decided that it wasn't possible to get it through in this Convention, but we had in mind that all these would be put to Mr. Burger, who could actually draft us a Constitution with all these matters in mind, ready with proper resolutions to put forward. I think it is only fair under these circumstances to promise, providing my Executive do not overrule me, that the amendments to the Constitution will be put before the next Convention before the election of the Executive. There now, I think that should satisfy everybody.

Mr. SMITH (Boksburg): I would like to make a further suggestion, if I may. When the Executive considers this proposal on the election of the Executive, I would like to suggest that each province be responsible for the election of its own members. In other words, if Natal has three or four members, then the members from Natal elect their own members; Transvaal, Orange Free State, and Cape have nothing to do with that election at all. Cape elects its members and each province elects its own members and so on, including the Rhodesias. I think that would work probably better than the other method.

Secondly with regard to the point raised about the smaller municipalities not attending, the fact is that the expenses are going up and I know (I have worked in a smaller municipality before) they haven't got the money. That is one of the reasons why the Municipal Association has ruled having the Conference every second year, because of the expenses going up. You mentioned an increase of £2 2s. 0d. actually there is a 100% increase in some cases, for some of these members from £4 4s. 0d. to £8 8s. 0d., whereas it drops down to nil for some of the larger municipalities, and I think that with the increase of fees you are going to have a greater drop in the number of smaller municipalities attending.



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Another suggestion I would like to make is that the Convention here be thrown open in some years for the smaller municipalities to control, in so far as papers and so forth are concerned. For many years we get the aspects from the very large municipalities and nothing from the smaller ones. I think it would stimulate interest if we could get contributions from the smaller municipalities and with regard to the changing Executive I think there should be a greater change so as to allow other municipalities who are of smaller strength, and smaller interests, and so on, to serve on the Executive and give them the experience as well, so as to bring a little fresh air into the proceedings here in this Conference. I make these suggestions, Mr. President. Thank you.

THE PRESIDENT: Thank you, Mr. Smith, I would remind you, of course, that we had great difficulty in getting one paper this year and we circularised everybody. Anyhow these points will be borne in mind. It is obviously quite a large subject and we will have to consider it during the year to get something for you, which we hope will meet all needs, at the next Convention.

We now adjourn till 2.30 p.m.

2.30 p.m.—Convention Resumes.

THE PRESIDENT: This is the afternoon when we have the Engineers' Forum, as you possibly saw from the Bulletin, we intend to run this Forum this year in the same way as the British Power Convention runs it. In other words we have here a fine body of men—our Brains Trust (Laughter) as Mr. Downey said definitely picked for their beauty rather than brains, but that is up to you. I am now going to hand over to our Quizmaster, Mr. Jack Downey, and having been presented with a cigar during lunch time I am coming down there. So it is over to our Quizmaster, Mr. Jack Downey.

Mr. DOWNEY (Springs): Thank you Mr. President. (Applause.)

THE PRESIDENT: I am just going to suggest that you all sit down for this, and nobody stands up except those who are answering questions into the microphone, but as far as the Brains Trust are

concerned they sit down there just like an ordinary common or garden committee. I suggest Mr. Quizmaster you go in the middle there and hand it to them as you go.

Mr. DOWNEY (Springs): I think it will be better, Mr. President, if I stay here, then I can watch them. (Laughter.)

Mr. President, Gentlemen, remember last year I got inveigled into this job, when the President was overseas. You remember the spot that he put me in with that yellow waistcoat at Bloemfontein and I can't find a yellow waistcoat anywhere. Last year I had to provide myself with a yellow button-hole (we will call it a yellow button-hole, it sounds better), and I still can't get rid of this job. Now we have decided this year to try to help it along a bit, because last year most of you left me pushing the wheelbarrow and some of you who have had to take meetings, know that pushing the wheelbarrow is not so easy, so this afternoon we have provided you with a Brains Trust: Mr. Sibson, Mr. Powell, Mr. Kane, Mr. van der Walt, Mr. Burger and Mr. Downie.

They all, I think, don't need much introduction to you. Now you have before you a list of questions which were received in time to be stencilled. I have other questions besides, which I will put to the Brains Trust afterwards. The procedure will be that I will put the question to the Brains Trust first, after the Brains Trust have discussed the matter, and there is not a satisfactory conclusion, which I don't think will happen very often, we will put them back to the floor.

Question No. 1:

MAXIMUM DEMAND METERING:

(a) What is the mean theoretical correct and equitable time interval for demand measurement?

Note:

Escom works on 60 minutes (Klerksdorp). It is understood that the Natal and Cape Western Undertakings work on 30 minutes.

(b) Should demand be measured by the straight line method (integrating type of meter) or logarithmic method (heater element type)?

Notes :

- (i) The log method will produce a higher value than the other method under fluctuating load, the difference being greater with greater fluctuation—in other words, the consumer with a low load factor is penalized by using the log method, whereas the effect is not reflected using the other method.
- (ii) *Example* (Say meter time interval is 30 minutes).
 Load—100kVA.
 Loading cycle—100% for 15 minutes, nil for 15 minutes.
- (a) Integrating type meter will register 50 kVA.
 (b) Heater type meter will register approximately 90 kVA.

Mr. POWELL (Johannesburg): Well, Gentlemen, I think you will agree that this is rather a ticklish question to be thrust upon one. First of all I would like to mention that as you all know I am one of the blue-ticketed boys, and therefore anything that I might say that appears to be advertising is entirely coincidental. I will try and give you my honest and frank views as an Engineer. There is a Bill Powell the engineer and there is a Bill Powell the other bloke, and I hope you will believe that.

(a) Well I think the correct answer is that there is no mean theoretical correct and equitable time interval for demand measurement. You all know as supply engineers that the object of maximum demand metering, whether it is in kilowatts or kVA, is to endeavour to reimburse yourselves for the fixed costs of your equipment both generating equipment and distribution equipment, and just how you achieve that doesn't really matter as long as it is equitable; and that is what you are trying to achieve an equitable way of doing it.

Many, many years ago a very eminent engineer named Hopkinson thought of this idea of a two-part tariff and introduced the idea of making a measurement, of charging people for their responsibility, for their maximum demand, because that is in effect what controls the capital costs of your equipment, and to follow that on with a unit charge to cover the running costs.

Over the years engineers have racked their brains to try and find the most equitable way of doing this, and maximum demand meters have measured at quarter hourly time intervals, 20 minute time intervals half-hourly time intervals, and 60-minute time intervals. I suppose one might say that an instantaneous measurement is a true reflection of maximum demand, but that would not be quite true because we all know that our apparatus can take sudden kicks like that of starting currents from motors quite easily without having any adverse effect on them. That might not be quite true in the case of very small sets, but we must generalise and take a sort of broad idea of supply engineering, and, I think, consider the small generating set as something exceptional.

Now it must follow that if you adopt say for example a long period for a time interval, and a consumer has a very fluctuating demand (he may for example take a peak for perhaps a quarter of an hour or so), the actual result on a maximum demand basis if the meter is of the integrating or Merz type will tend to measure low. It won't give any indication really of the effect of that maximum demand on the system. Whereas a meter of the thermal type will more quickly interpret what is actually happening to the electrical apparatus itself. Any peak demand should be, strictly speaking, measured, and reflect the effect of the peak demand of the system apparatus. If we ignore the theme side and confine ourselves solely to the electrical side, I think you will agree that the adverse effect on an electrical demand will be the heating effect on the system whether it be cables or transformers. Therefore, the integrating type of meter to my way of thinking can't correctly interpret that effect; whereas the thermal type of meter does because apart from showing what is actually happening at the time when it occurs, it also correctly mirrors or reflects the effect of even previous maximum demands.

In other words it tends to aggregate the heating effects of loads that have taken place over given periods. If you adopt a very short interval for measurement, then of course the man who has a load for a

very very short while can tend to be penalised, and for his short indiscretions, and because of the tendency to penalise the man for very short periods, and the fact that a man with a long period tends to escape to a certain extent his liabilities, it is becoming more or less accepted that the 30-minute period is probably the fairest compromise between those two periods.

This really means it is of purely arbitrary value; I mean there is no theoretical approach to it at all to my way of thinking; it is of purely arbitrary value which tends to ignore the sudden short time peaks or indiscretions of a consumer, and, at the same time doesn't allow the man who has a very poor load factor to escape his responsibilities.

This thing, many years ago to my memory, was thrashed out by a special committee of the Electricity Supply Commission in Britain, and they were generally of the opinion that 30-minutes would be a fair period to meet all cases.

Regarding the answer in connection with Escom, the reason why Escom uses 60-minutes is for another purpose altogether. That is, in the early days, and to a certain extent even today, they have a lot of printometer readings to assess. When you talk about Escom I presume it refers to the Rand undertaking. It is only the Rand undertaking that uses 60-minutes MD period. They have a lot of printometer readings their statistical department has to sort out every month, and if they use the 30-minute period they would, of course, have many more indications to assess in order to arrive at the maximum demand, so they felt that 60-minutes rather reduces the statistical work. At the same time, whilst they appreciate that they probably lose on it to a certain extent, bearing in mind that in gold mining actual sharp peaks are not so frequent maybe as with the small industries and commercial people, they feel that they are quite happy about it. Even if they do tend to lose by it from the point of view of monetary return, that is easily adjusted by the fact that if in the course of time they do not become reimbursed sufficiently they simply have to make the tariff meet the case. Right, Mr. Quizmaster, would you like me to go on to B or would you like to discuss A first?

THE QUIZMASTER: Is there anybody on the panel who wishes to discuss A?

A SPEAKER: Just one word Mr. Quizmaster. The straight line method involves measuring the question of time, have we been talking all this time just about 30-minutes. (Laughter.) The only comment I make there is to agree that it is entirely an arbitrary figure.

A SPEAKER: I was hoping that Mr. Powell would say that in the Rand Undertaking we should consider a special commission of enquiry, because it indicates that we perhaps try to hide some profits. (Laughter.)

I am sorry that the question of half-an-hour was mentioned, Mr. Chairman. I hope Mr. Milton is not listening too carefully, because I think it will be to our disadvantage if they change over to half-an-hour. I trust the E.S.C. will keep to an hour.

THE QUIZMASTER: Do any members of the panel wish to speak?

A SPEAKER: Mr. Quizmaster, I think this is rather an academic question.

I cannot understand somebody being concerned whether or not to measure maximum demand by means of an integrating meter or by a meter with a logarithmic method as it has got here. If there were just two or three consumers making a demand on a particular item of equipment like a transformer or a power station there might be something to be said for the heater element type, but where you have a large number of bulk supply consumers it doesn't matter very much because you get the element of diversity. In circumstances like that the ordinary integrating watt hour type of demand meter does the job, and the Undertaking gets its revenue. I don't think there is very much unfairness as between the consumer with a good load factor and a bad load factor under such circumstances where you have a large number of bulk supply consumers, and your diversity can be taken into consideration. I would say that the integrating type of demand meter does the job well, and there is no need to worry about any other type of meter.

THE QUIZMASTER: Any members from the floor wish to discuss this matter?

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Mr. MILTON (Johannesburg): Mr. Quizmaster, if you wish to hear from me, certainly and I can't promise not to take some notice of what is said at this meeting when it comes to reporting back, and perhaps redesigning our time interval. To give the correct impression though, the one hourly time interval that is used on the Rand undertaking is a carry forward from the old E.S.C. days, and dates back a very very long time. It is difficult to change that time interval at present, and I think some people will be pleased to hear that I think it will probably therefore remain at an hourly time interval for a long while. But I would suggest that quite possibly the reverse effect might be felt by the municipalities if we dropped down to the $\frac{1}{2}$ hour, and they might be pleading for it, from that point of view, because there is rather a peaky load from mines due to mine haulage. The half hourly period I would not agree to call an arbitrary figure, I would rather call it empirical, because it is based on your volt drop conditions in your services as well as the heat components in the plant.

Back to the generating station it is not quite so important, but in your distribution and feeders it is a very important matter, and quite short time intervals are important there, so it is really an empirical adjustment between the short time interval on voltage drop on service mains as compared with the long time possible with the modern transformers and generating plant.

THE QUIZMASTER: That disposes of Question No. 1 (a), Gentlemen. We will go on to (b). Will the panel start on (b). Make it short, Gentlemen, we have not got much time.

Mr. POWELL (Johannesburg): Well, the question is quite self-explanatory, Gentlemen. I would say this ties up with (a) in the sense that the heater method as mentioned by the enquirer probably indicates more correctly the effect of maximum demand on the system apparatus. There is an example under (ii) which refers to the effect of a hypothetical load which I think is almost highly dangerous, because one can cite an example of any load that is measured by a Merz maximum demand

indicator which falls between the time interval period. Let's assume for example that the time period is on the hour and the half hour if this particular period mentioned by the enquirer over 100 kVA. occurred over the whole half hour period. Between say quarter to and quarter past of the hour the indication would only be 50 kVA., and if the time interval is an hour, as on the Rand undertaking, and the load was 100 kVA., the MD indicator would only indicate 25 kVA. and I believe that factor was taken advantage of, most of the Reef boys will be familiar with this, was taken advantage of by many consumers during the load rationing period when they arranged to put their maximum demand between the half period of the 60 minutes; in other words they were able to put twice the quota load value on and get away with their quota.

I think that is all I need to say about that, other than to reiterate that I think the logarithmic curve more correctly reflects the actual conditions happening on the system and therefore it is probably a more correct indication for tariff purposes.

Mr. SIBSON (Bulawayo): I wanted actually to say something rather similar, drawing attention to the importance of the time interval and its exact incidence.

It is obviously important whether it is 10 o'clock or ten past 10 or whatever time it is that the 30 minutes starts. That point has now been dealt with by Mr. Powell. The disadvantage of the heater type, of course, is that it is technically less accurate although the ultimate result is better in that it gives a picture of any 30 minutes of demand, not a particular 30 minutes. As a means of measuring electrical power accurately it falls rather short of the integrating method, which can be extremely accurate, particularly if one uses certain types of apparatus which take complete account of power factor. So where the time of incidence is unimportant, then the logarithmic method is a better proposition, because its inaccuracies are not as great as the errors that crop up as a result of the exact time interval not necessarily coinciding with the incidence of the load.

I think there is a case, although this is not really part of the subject, a case for

reconsideration of some of these big tariffs particularly to towns where one might take into account this time interval. It is not done at the moment; the incidence of load is not related to time, it is merely related to any 30 minutes or any 60 minutes as the case may be. And I think some of the major undertakings supplying large blocks of power consumers might some day consider the importance of taking a counter diversity, and if that is done then the other method, the intergrating method, will be the obvious method to employ because it is completely accurate and refers to specific time.

THE QUIZMASTER: Any member wish to discuss this further? The panel has already occupied half an hour too long, Gentlemen. We will go on to the next item. Gentlemen. Domestic Tariff—No. 2. Do you wish me to read it or have you all got copies. It will save time if you take it as read, Gentlemen. Mr. Sibson will you open this point—Domestic Tariff.
Question No. 2.

DOMESTIC TARIFF

"Many years of experience of domestic tariffs with minimum charges based on the valuations of properties plus observations I have made in connection with supplies to my Council from an Authority that uses the room basis, and the fact that, to-day, there is little or no relationship between the value or size of a house to the connected load within it or the maximum demand its occupier is likely to impose on the Supply Undertaking. This convinced me long ago the time had been reached when Domestic Consumers supplied from the same Authority should be charged on a common bases. That is, in fairness to all concerned, there should be one common minimum charge, except when the actual monthly, annual or all-time maximum demand is measured and the minimum charge based on the measurement made e.g. ampere demand.

I would be pleased to hear from adherents to the variable minimum form of Domestic Tariff why they continue doing so, bearing in mind the extra work involved in keeping count of the number of rooms or looking up valuations, then sometimes having to argue over the assessments."

Mr. SIBSON (Bulawayo): This whole question of domestic tariffs, and for that matter most tariffs, to the individual small consumer is of necessity a compromise. We always try to find the exact and perfect method of assessing what the liability of any consumer is for an undertaking, but it cannot be done reasonably and practically as the cost of doing it is far in excess of the revenue obtained from the consumer. One must therefore of necessity look at these things somewhat statistically and think of the domestic consumer rather as a group of consumers, and not attempt to get the exact correct return from each one individually.

Well now what is needed (as we said earlier this morning), is a tariff which ensures that a consumer will repay those costs, those standing costs in which the undertaking is involved, and at the same time encourage the consumer to use electricity, although as I said not to make the encouragement too exciting, but at least produce a cost which will enable the consumer to use electricity instead of other forms of power such as wood and coal for heating. It doesn't matter very much from an electricity supply point of view what method you use to ensure the compliance of those two requirements, and there are at least three different methods that are in use.

There is the system, which I think Cape Town employs which is a service charge, and then all the units are at a low rate. You get the system which I think Port Elizabeth used, if it doesn't still employ, which is to work on the valuation of the property for the initial high charge. And then there is the room tariff as the least objectionable. It has objections of course, it is illogical; but everything we do is bound to be illogical on this difficult subject, and it seems to me to have the least objections. It does bear some relation to the size of the house, and although one can quote instances of bachelor flats using 1,000 or even 2,000 units per month, I think over the whole statistical average you would find that the large house imposes a greater demand on the network, and therefore should pay a little bit more for their standing charge.

So out of the various means and devices that have been evolved over the years I am inclined to think that probably the room tariff is the easiest of all to administer.

A SPEAKER: Gentlemen, I think there has always been some misconception over this particular type of tariff, first of all it is not a two-part tariff, it was never intended to be a maximum demand tariff plus a follow-on tariff. As its name implies, or to my knowledge implies, it is an all-in tariff. Originally in my early days as a youngster we had two tariffs.

We had a lighting tariff which was a high rate, then we had a so-called power tariff which entailed the use of two meters; then, later on, it was decided it would be much better if we could adopt a sort of tariff which would ensure that the undertaking was reimbursed for the low load factor, high peak unity diversity load known as lighting, and at the same time bring in a tariff which had a sort of promotional element about it. Why I say it is not a maximum demand tariff is because the whole idea of the tariff is to encourage consumption; there is no attempt at all to limit maximum demand. It is to try and pay for the high rate units, and then, after that, use what you darn well like regardless of what is the maximum demand. Therefore any sort of tariff, or any arrangement, whether it is by measuring the size of the house, or counting up the number of rooms, or using rateable value, doesn't matter a darn as long as you can pay for these high costing lighting units which always occur right on your evening peak load, or always used to in the old days anyway.

Mr. VAN DER WALT (Krugersdorp): And now Mr. Quizmaster, I cannot agree. This is an all-in fight now. Mr. Sibson said that the room tariff is the easiest to administer. I beg to differ very widely from him. Tariffs are still maintained as the hobby of every electrical engineer. The main thing is, do you get the same results at the end, and I say whether you apply room basis or a sliding scale you can, by selecting your scale, come to the exact same figure as your room basis. I say that this is easier to administer; you have nothing to check, no room areas to work out or calculate and no inspectors to send

round; so I maintain that as long as you get the same result, tariffs today, as previously said, should be an encouragement to use electricity. Or another view to look at is what the consumers are prepared to pay. If we can get that from the consumer he is happy. It is simple, he knows what he is paying for. I say, why apply the room tariff? Have the sliding scale which is simple and we are happy. Thank you.

Mr. DOWNIE (Cape Town): Mr. Quizmaster, I can only go by experience in Cape Town and I can say this that we have had the room basis for many years now. We have never had any trouble with it, and there is a certain amount of promotion about it, and consumers as a whole are quite pleased with it. As a matter of fact our room charge (1/10d. per room) happens to be a bit on the low side at the moment, but we compensate for that by tacking some of the demand related cost on to the unit cost, 3/4d. per unit, which is rather a little more than a domestic consumer should pay in Cape Town anyway. You can effect a compromise. If you can't get enough out of the room charge you can tack a little on to the unit charge. I reckon that the room basis or the valuation basis is a method of recovering the costs and revenue from the consumers that works. As Mr. Sibson says it is one of the least offensive methods of doing it. It will be interesting to know why people now are concerned about this particular type of tariff, and are thinking in terms of an ampere demand meter, or even miniature circuit breakers. It would be very interesting to hear from members of the audience why they are thinking in terms of these ampere demand meters or miniature circuit breakers. I am sure that there are at least one or two in the audience who can say something about it.

THE QUIZMASTER: Anyone from the floor?

Mr. MILTON (Johannesburg): Mr. Quizmaster, I can't resist this challenge. Yes, there are some people watching me too, so I will have to be a little bit more careful than I might otherwise have been.

In the first place I think we are over-looking the developments that have been taking place in the use of electricity for

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domestic purposes. We are getting up, in Salisbury, to the 9,000 units per year per domestic consumer. What does that mean? It means the all electric house, where electric appliances are very freely used, and the demand per consumer is becoming something which to Salisbury, at any rate, is involving it in putting in a very large amount of generating plant, distribution system, and services.

The question arises as to whether in a community we are sufficiently communistic to say that it doesn't matter a darn where the cost arises or how it arises: everyone pays the same. I am not one of those people who agree with that principle; and I do think that the time is arriving when we will actually have to measure the maximum demand component of the domestic load in order to see that the people creating that demand pay a fair share towards the cost of meeting their requirements. To my way of thinking, the only way that can equitably distribute the demand related costs is by measuring the maximum demand. Unfortunately our manufacturing fraternity have not yet given us a sufficiently cheap instrument to measure a quantity which it is so essential we should measure economically. One can measure it if you are prepared to spend say £60 on a meter but to spend £60 for a revenue of £60 per year is rather a ridiculous proportion. Those figures are quite arbitrary, not empirical, but I think give you an idea of what is happening. Now the manufacturers are, I know, endeavouring to introduce some form of reasonably accurate cheap meter for the determination of maximum demand. Once we have got that type of measurement available to us, I think we can allocate our costs to the consumers on a more equitable basis than we are doing at the moment. After all, the cost of supply to the consumer is involved in keeping a number of books of accounts which must be audited and so forth, and it doesn't matter if that consumer's account is 5/- a month or £50 a month, those costs are virtually the same. There is, shall we say, a minimum of expenditure on distribution which is involved in getting a supply to a consumer's premises; one can take that basic expenditure as pro rata to a number of consumers regardless of their

use. Then, in addition to that, you have got to stiffen up your service for peak load; you have got to stiffen up in order to give a good service in the way of voltage to the particular consumers concerned, so that you can arrive then at a demand related cost. Then, as we are all aware, you have got the additional costs which are truly related to the number of units taken. If they aren't taken you save the money, if they are taken the consumers have involved you in expenditure.

Virtually you boil down to 3-part tariff, which should be applied to domestic consumers today. That can only be given effect to by say a charge of 2/- per month, a charge of so many amperes of maximum demand, because I think it would be difficult to incorporate a voltage element in a cheap meter and so much per unit. Under those circumstances your unit rate can drop to virtually the same unit rate that you apply to any of your large users, and your .55 or .5 as was mentioned by Mr. Sibson this morning, might be the figure in Salisbury. A very much lower figure would be possible in many other places.

I think then, that the answer to Mr. Downie and his views is that that will come, and that is one of the reasons why we are worried about it. Unfortunately our Quizmaster is in the Quizmaster's position, but I think he is one of the most well-informed people on this particular question because he has been carrying out a lot of investigating work into this incidence of maximum demand from the all-electric house, and the users who are really making extensive use of electricity. In the meantime, I am a protagonist of the ordinary room charge, that is, a service charge per room such as Mr. Downie uses, and the recovering through the medium of the unit rate of the demand charge. You will find if you examine the actual use by consumers, if you take a few check measurements of their maximum demands, that if you were to apply a demand rate and a unit rate, a true unit rate to those consumers, you approximate fairly closely to what they are paying when they are paying, shall we say, 2 to 4 times the potential low rate in their unit rate system, and a reasonably low unit rate in their unit rate system, and a reasonably low service charge per room.

You will of course, get anomalies. You get anomalies in any tariff. One of those anomalies has been suggested on the previous question (I hope I am not out of order), in which we were told that we might investigate the actual time of peak, in other words to determine your costs on an actual peak relative-cost basis instead of a potential basis. For the meantime I do think that our present method of using the room basis graded tariff is preferable to any other in equiting the consumers. It is all very well saying you get the same revenue from your top-rate tariffs or other tariffs or any type of tariff you care to introduce, but that revenue comes from a group. I can get the revenue from a group by charging anything I like, provided the two items of that charge are suitably related. Whether the application of those to an individual consumer is fair to each individual is entirely another matter.

THE QUIZMASTER: Mr. Stevens did you want to speak? All right, Mr. Muller.

Mr. MULLER (Bloemfontein): Mr. Quizmaster, I have recently had the opportunity to go over my tariffs. We had a valuation basis and we found that we were actually losing for no better reason than that our town is divided into an old part and a new part, and into people that were using the same amount of electricity in very small premises and in large premises. We have found by analysis that a very large proportion (as much as about 50%) were getting away with about 10/- a month less on the same number of units than the upper valuations were paying, and a small minority, I may say it is a minority, but still there were those cases that were getting away with over a £1 a month, which obviously is unfair.

It would mean, if it was averaged out, the people who were already paying more or less a fair share would have to be further burdened. We then set about finding something better than the valuation. The room basis, I think, is distinctly better. It has at least some bearing on the size of the premises, although again, you will find that flats, modern flats today, are very small; small in number of rooms, small in area, whichever basis you take it. They use as much in current, and their demand is com-

parable with any reasonably sized house, so that from this angle it has its disadvantages. But, to my mind, it is at least better and more equitable than the valuation basis which burdens the new houses.

There were old houses in Bloemfontein with more rooms and with potentially more load both for lighting and heating than some of the smaller houses. Because they were built in 1947 or 1948, their valuations were higher and they were actually paying for no better reason than that they were new houses. We thought of the room basis, but the time involved in taking a census and reverting to a tariff of that nature would have been more than we could face in the time available to change the tariff, so that we had to let that slide.

The alternative of what I considered the very best of getting a demand either by maximum demand ammeters or by circuit breakers occurred, but again we had to bypass that on account of time, and, I may say, cost in the case of the demand ammeters. We have therefore gone on to the sliding scale which was the easiest applied under the circumstances. On this question of the demand ammeter and circuit breaker, I rather seem to favour the circuit breaker because demand controls interest and redemption, and, unfortunately, your interest and redemption remains the same from January to January. It is very little satisfaction to you to get, shall we say, 50% of the winter demand in summer or the other way round. In the case of the miniature circuit breaker arrangement, the consumer would himself fix what his size of service should be, and, as long as he is satisfied with it, everybody will be satisfied. He then pays from January to January on the size of load which he considers suits him.

Thank you, Mr. Quizmaster.

THE QUIZMASTER: Thank you Mr. Muller. Mr. Stevens you wish to speak. Gentlemen I'll have to warn you, I'll have to put a demand meter on you. You must not speak so long. We lost about half-an-hour on the first question. You must make your answers very short.

Mr. STEVENS (Ladysmith): Mr. Quizmaster, all but Mr. Van der Walt of the

Brains Trust seem to have missed the point as far as I am concerned. I rather place more importance on the administration of the tariff. You cannot deny that having to keep track on the number of rooms and valuation of houses involves some work. We at Ladysmith do not use the maximum demand ammeter; we have what we term a core minimum, or in other words, a sliding scale.

I was most interested in what Mr. Milton started off by telling us, that he today, after so long supporting the room basis, is now beginning to think that perhaps there is something to be said for departing from that. I hope, Mr. Milton might come on the floor again. But I think he did say that there was something to be said for measuring the demand, and that the commercial fraternity were trying to find us an instrument which would do that cheaply. In the meantime, I feel that the next best is a sliding scale, and I am very pleased to hear that I have got a least one supporter amongst the Brains Trust panel.

THE QUIZMASTER: Gentlemen, I want you to please be brief, I have got a lot of questions here, otherwise we will miss the value of them.

Mr. INGLES (Pietersburg): Mr. Quizmaster, Gentlemen, I think most of the previous speakers have rather overlooked some of the difficulties of the smaller town. From that point I am going to touch lightly on a smaller town's difficulties.

One is this: if we go to the room basis, it means we keep additional staff to keep a check on the rooms, or otherwise relying on the Town Engineer, which as you all know is rather an unsure proposition. In Pietersburg we have adopted the principle of valuation: but, in order to overcome the difficulty of having various valuable houses each consuming the same number of units, we have adopted a valuation up to a maximum of £1,500 for a domestic value. Above that the valuation remains the same, and the unit charge is the same for everybody in all cases, and I think that gets away with most of the difficulties of the small towns. Thank you Mr. Quizmaster.

Mr. HALLE (Pietermartizburg): I would just like to ask the Brains Trust why we

stick to this old Spanish custom of excluding the kitchen, pantry and bathroom, because without them you would hardly sell any electricity. (Laughter).

Personally I think the room basis is the idea. I would like to see the kitchen and pantry put into it, so that the room charge be less; it would be pulled down, and we have got to remember that some day we are going to get air conditioning, space heating, and so forth and then your room is going to mean something. That would then be the fairest way to assess those cooled or heated rooms.

Mr. SIMPSON (Durban): I think I must report that finally, and in the not too distant future, it will be very necessary to try and record the demand of each consumer. In Durban for instance, there is a very big trend towards air conditioning, and it is not uncommon now for some of your bigger houses to put in maybe up to 7 h.p. of air conditioning in addition to normal lighting, heating, and cooking demand.

Whatever you use in the way of room basis, or valuation, or any of those rather arbitrary methods, you are still going to be in trouble in fairly charging the consumer. You get other cases where you might get no cooking. Now in the common basis it is averaged out, and he still pays; but I don't think the consumer minds that while the load is fairly low; but, as these other people contribute and take more, I think ultimately that is what must happen. In the meantime, we have got to find the method that causes the least possible trouble, and is most easily understood by the consumer, and I think the room basis is possibly the fairest method at the moment.

THE QUIZMASTER: Well, Gentlemen, I think that disposes of Question 2. It is not my prerogative to discuss this problem, but I might give you some information. From tests taken we are finding out that consumers are averaging out at 7 kilowatts per house, and the unit consumption is between 400 and 500 units per month. In one case one consumer was using 8 kilowatts and his monthly consumption was only 200 units for the month. We will now go on to Question 3, so I will ask Mr.

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Burger to open up the discussion on Question 3.

Question No. 3:

PROVINCIAL ROADS

"It is quite common in the Transvaal (and probably in other provinces) for some of the main roads within the town boundaries to be under the control of the National Roads Board or the Provincial Roads Department.

If a supply authority intends to construct a power line along a provincial road it would appear from Clause 48 of the Electricity Act that it merely has to serve 30 days notice to the authority having the control thereof. In practice, however, the usual procedure is to apply to the authority which controls the road for permission to erect the power line within the road reserve. Permission is generally granted subject to certain conditions which are often unduly onerous and in my opinion, unreasonable.

Some of the conditions which were imposed when my Council recently approached the Provincial Roads Department for permission to erect a power line along a main road were as follows:—

- (1) The Council will have to meet the cost of moving the overhead route if this ever becomes necessary for road purposes.
- (2) The Administration will not be liable for any damage to the Council's installation which may be caused during road construction or maintenance operations.
- (3) Along and across the road, no poles or stays may be erected within 8 ft. from the edge of the black top surface.

I may mention that in this particular case one of the purposes of erecting the power line was to provide Class A street lighting along the road in question and it was therefore advisable that the poles should not be more than 3 ft. from the edge of the tarred strip. It may perhaps be argued that the Provincial Roads Department has to bear in mind the possibility that the road may have to be widened at some future date and that the

stipulation that no poles should be erected within 8 ft. of the tarred strip is not unreasonable but I submit that the other two conditions stipulated in regard to the moving of the line and the liability for damage which may be caused by the Provincial Roads Department are most unreasonable.

Bearing in mind the provisions of Clause 48 of the Electricity Act, I should like to know whether the Provincial Authorities have the right to impose such conditions on a Municipal Electricity Undertaking."

Mr. BURGER (Paarl): Mr. Quizmaster, and Gentlemen, this looks a very sporty question framed in its innocence here, but unfortunately the answer is somewhat complex. It is complex because you have in South Africa a great variety of road legislation. In the Transvaal alone you have the Main Reef Road controlled by the Main Reef Road Ordinance; you have district roads, provincial roads; you have national roads, and, in addition to that, you have ordinary streets and roads within municipal areas controlled solely by the local authority.

It depends on the class and type of road whether it is controlled by the province, or by the local authority, or by the Central Government. I may, just in passing, say that in the Cape and in the other provinces the position is not quite as complex as in the Transvaal. The position is that Section 48 of the Electricity Act says that an authorised undertaker may break up any street within his area and erect posts and lay or construct pipe lines or power lines, under, along or over any such street and from time to time repair, alter and remove these lines or posts, provided the authority having the control thereof shall have the prior right to open up and make good such street at a reasonable charge. In other words the supplier of electricity can dig up and put in his power lines, but with the understanding that the authority which has the control of this road has the prior right to do the necessary work.

In short the question here is this: if this authority becomes difficult, if this authority lays down rather onerous conditions, is it entitled to lay down any conditions at all? Isn't the supplier of electricity entitled just

to go ahead and to lay down his power line? Mr. Quizmaster, reverting for a moment to Section 48 as I have read it to you, the immediate question that comes up here (and this is really the question on which the whole point raised turns) is: does Section 48 of the Act also bind the Crown? In other words, does this Section apply to the National Roads Board, does it apply to the Province?

You know that that is always a difficult question to answer, but in this particular instance my answer is that it does apply to them. I don't want to take up much time by reading a lot of legislation, but I would refer you to Section 48(8) of the Electricity Act which says: 'For the purposes of this section street includes any roads, square or open or enclosed public place, the control or care of which is vested in any authority.' So that if the authority happens to be the Province, or the authority happens to be the Central Government, the fact remains that the supplier of electricity has got the right to do the necessary to put in its power lines. However, I want to qualify my answer with reference to the National Roads Act. The National Roads Act is a later act than the Electricity Act, and puts the control into the hands of the National Roads Board. I feel that the National Roads Act does derogate from the strength of Section 48 and therefore your City or Town Electrical Engineer who wants to carry along with his power line in a road must make sure first of all exactly what class of road it is. Depending on what class it is it will vest either in his own local authority, when he has no problem, or it will vest in the Province, where in my opinion, he is entitled to put his power line in a proper manner without accepting any onerous conditions; or thirdly he must consider whether it is a proclaimed National Road in which case he will have a much more difficult task.

THE QUIZMASTER: Thank you, Mr. Burger. Any members of the panel wish to discuss this? I think that disposes of that question, Gentlemen.

Mr. MILTON (Johannesburg): I will be very brief, Mr. Quizmaster, but I think there is one point that I would like some enlightenment on. Section 3 of Section 48

says 'and according to such plan showing the route and such specifications as may be approved by that Authority', which indicates that there is a very severe control possible from the authority controlling the roads. You cannot just cross a street where you like, or run down a road where you like, without having first submitted plans and got approved specifications.

Mr. BURGER (Paarl): Mr. Quizmaster just for the sake of briefness I did not read the whole section to you, but in reply to Mr. Milton I would like to say that the Act does state that it must be according to specifications, etc., approved by the controlling authority. But that is not relevant in this particular case, because the question here is not one of approving specifications, it is the laying down of onerous conditions, having nothing to do with specifications.

A SPEAKER: Mr. Quizmaster, I don't want to comment, and I don't want to discuss, I merely want to ask whether the Association could not get this opinion expressed by our Legal Adviser checked by Council, because it is a very important statement he has made, and, in view of all the multitudes of difficulties we are experiencing, I would dearly like to know if the Association can't afford Council's opinion on that. Thank you.

Mr. KANE (Johannesburg): Mr. Quizmaster we have got to be a little bit more reasonable about this sort of thing. This first condition, under certain conditions, I admit could be very onerous. For argument sake, if, shall we say, the road isn't entirely complete, then the province is legislating for some possible unknown condition. I think if somebody wanted to come along and interfere with our mains for some specific purpose we ourselves would apply somewhat similar conditions. The question about Item 2, Administration not being liable for any damage: I think that is unfair, but I think you have got to investigate the general conditions applying at the time. If you get a National Road that is not properly made up, there is a very narrow strip of tar, for your benefit, or your consumers' benefit, or your ratepayers' benefit, you want to light that road, they are prepared to let you do it. But they are not prepared to meet the cost of shift-

ing that at a later date when they improve that road, which will also benefit your ratepayers.

THE PRESIDENT: This point has actually just taken quite a lot of our time here in Rhodesia while we have been discussing our new Electricity Act which has just been promulgated. We have done quite a lot of work on this and we think we have got it tied up, and our Legal Department of the Federal Government has agreed that what we have got now gives us everything that we are likely to get.

Just one or two points in that. The reason why I mention this is, it is possible that we might be able to save Council's opinion. If Mr. Burger compares the new Electricity Act here with the old one in South Africa, he will see where the differences are, and possibly that will give you the answers you require. The position taken by the Federal Government Roads Department is, that if they obtain a servitude for a road, then it is for a road and for their use only, and they cannot grant you a servitude within a servitude. With our new legislation we have got that covered, and we now can go within the roads. But, as Mr. Kane mentioned, there is that position where you might want to do something they don't want you to do, and that is left to the Minister, and the Minister's decision on it is final. Whether that is in the South African Act or not I don't know. In your case I presume it will be the Administrators, or someone like that. But I do suggest that if Mr. Burger gets hold of a copy of our Act, and compares that with the Electricity Act in South Africa it might help. Thank you.

THE QUIZMASTER: Gentlemen, I don't know what to do with this President of ours, he came up here and told me to adjourn the meeting for tea and promptly gets up and goes and talks for ten minutes at the microphone. Gentlemen, we will now adjourn for tea.

3.30 p.m.—*Refreshment Interval.*

3.45 p.m.—*Convention Resumes.*

THE QUIZMASTER: Now Gentlemen, we will proceed now with our Engineers'

Forum. I don't want to cut anybody short, but does anyone want to speak on Item 3. Yes, Mr. Smith.

Mr. SMITH (Boksburg): As regards this question of moving poles on provincial roads, we had a practical demonstration in the Boksburg area just recently. The Province built a first class road between Boksburg and Benoni, a provincial road, and after they had laid the road we put in our pole lines according to their wishes, according to their instructions and conditions, etc. A few years later they decided to widen the road, and they asked us to move the poles. The Council of Boksburg refused to do that unless they paid the costs. There was quite a lot of correspondence and fighting on the issue, but in the end the Province agreed to pay the cost of moving the pole line. Thank you, Mr. Chairman.

THE QUIZMASTER: Well, now Gentlemen, that disposes of Question 3 we will go on to Question 4 — Electrode Boilers with Steam Accumulators.

Question No. 4:

ELECTRODE BOILERS WITH STEAM ACCUMULATORS

(a) "My department has installed an electrode boiler in the Ladysmith Corporation's Brewery for use at OFF PEAK periods which has proved both efficient and economical. Since, we have been asked to advise consumers on the use of these boilers for other purposes but, owing to the users not being able to do without steam during any part of their business hours, necessitating their boiler operating during our daily peak periods when the charge per kVA. of demand is far too high for an electrode boiler to be economical, we have had to advise against their use.

An idea we have, but not yet investigated, is for consumers needing steam throughout the day to install electrode boilers with steam accumulators to carry them over our peak load periods when the boiler is shut down by means of a time switch.

We realize there are many factors to be considered in connection with the design and operation of such an installation and the possibility of creating new peaks, nevertheless I feel sure that the views of suitably

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qualified Representatives of the Commercial Community and Others as to the practicability of the idea might lead to Supply Authorities being able to improve their Load factor in a way other than just controlling the water heating load.

(b) ELECTRODE BOILERS:

Should an Electrode Boiler installation, without an isolating double wound transformer, be permitted on a 3 phase 3 or 4 wire distribution system where the neutral conductor (if any) is earthed only at the supply point?"

A SPEAKER: I think very simply, Mr. Quizmaster, in the first place I am surprised at the questioner deeming to give advice to his consumers and what they should do. Really they should come to him with a scheme, and he should tell them what it is going to cost from an electricity point of view, if that, and let them stew in their own juice.

But there is no reason I suppose why you shouldn't have some form of steam accumulator. Frankly we have heard people talking about that for hotels, it has been going on for years, but apparently in the long run it seems to be too expensive as long as our electricity is as cheap as it is.

Mr. VAN DER WALT (Krugersdorp): We have had that same experience in Krugersdorp, we have got one working only, and that very recently, and I was surprised that the consumer put that in on account of the running costs compared with the coal fired boiler. As far as the earthing is concerned, Mr. Quizmaster, I would at first say right out "why not" as long as your earth returned resistance is low enough? Why should he not have a boiler on the 3 phase, 4 wire system with the neutral earthed at the transformer only? Is that the next question? Are you only dealing with (a)? I'm sorry.

Mr. SIBSON (Bulawayo): Mr. Quizmaster, I think the questioner is quite right to advise against the use of electrode boilers in the instance that he quotes. I am consistently advising my consumers against the use of electrode boilers, I think they are very wasteful pieces of apparatus. The thermal efficiency cold to water while using an electrode boiler is probably something in the order of 15% to 18%, and it is

a waste of natural resources to heat water in this way. However, these people will do it in spite of our advice to the contrary, and, if they are going to do it, then I think unquestionably they must pay the costs involved.

If an electrode boiler comes on peak then they must pay the full charges, and, in certain cases it is possible for arrangements to be made for electrode boilers to be used at off-peak times, and if the consumer wishes to employ steam accumulators or any other means of avoiding the peak, then well and good: he can get the benefit thereof. But I don't think it is our job to encourage the people to waste the natural resources by heating water by electricity.

Mr. POWELL (Johannesburg): I have nothing to say, Mr. Quizmaster, except that I see no technical difficulty associated with using the accumulator. It is rather interesting to see accumulators brought up at this Conference since I believe Salisbury is the only Undertaking in the whole country that has used accumulators. Probably the President can give us some information about the use of accumulators.

THE QUIZMASTER: Do you want to speak, Mr. President?

THE PRESIDENT: I have quite a lot of experience of accumulators. I wish I hadn't. As far as electrode boilers are concerned, we consider that they are too expensive to run unless they can be used off-peak. The only time we have found them used in Salisbury is where they have been used as water heaters rather than electrode boilers. In other words they have wanted something for very large hot water supplies and they have used an electrode boiler.

We have actually sold one accumulator to the Sugar Refineries, but that is not actually used in connection with an electrode boiler. I think actually you would find that the expense of installing a Ruth's accumulator, or any sort of accumulator for that matter, sorry for advertising, the expense of the accumulator itself would far outweigh any advantage you would get from the use of an electrode boiler itself. That is of course in this country. If the

price of coal was absolutely prohibitive and you had a very cheap source of hydro-electric power, then it would be a very different kettle of fish.

A SPEAKER (Pretoria): Due to the construction of an electrode boiler and the method of producing the steam, it is very small for its evaporative capacity. If you have to get an accumulator to take over during the time that the electrode boiler cannot be run, the price of the accumulator would be absolutely prohibitive. I don't think it would be an economical proposition.

MR. DOWNIE (Cape Town): Mr. Quizmaster, I had my Electrical Installation man on this job before I came up and this is what he said:

The first edition of the Wiring Regulations is silent on the subject of electrode boilers except to say that special permission must be obtained for their installation. In granting permission, we in Cape Town have accepted the practice of well established manufacturers. The point about the question is that an electrode boiler as usually installed can be looked upon as a starconnected load with a grounded neutral, and that any underbalanced current is a residual and will flow to the neutral of the supply point through the general mass of the earth. This does not apply where the earthing is not of the earth neutral, though the non-current carrying metal parts of the installation would still be carrying current. The 12th edition of the Institution of Electrical Engineers' Regulations take care of this in boilers up to 2,000 amps. capacity, and boilers above this capacity which are located adjacent to a supply system neutral earthing point are permitted to have the neutral connected to the boiler shelf. Such connection has never been made locally as it would have been contrary to the requirements of Regulation 102.05A.

One of the well-known manufacturers of electrode boilers considers that connecting the neutral to the shelf is the most sensible arrangement. The I.E. Regulations require for boilers that do not have the neutral connected to the shelf that protection be provided against excess underbalanced current. The S.A.I.E.E. second edition

regulations require this in general. I do not know of any boiler installed locally which is so equipped. Both the I.E.E. 12th edition and the S.A.I.E.E. second edition call for protection to limit possible voltage on exposed metal work. One of the well known manufacturers of electrode boilers provides this as standard equipment. The S.A.I.E.E. regulations for electrode boilers seem to have been based on the I.E.E. 11th edition which came in for considerable amendment in the preparation for the 12th edition.

THE QUIZMASTER: Any member of the panel wish to speak?

MR. VAN DER WALT (Krugersdorp): Well, Mr. Quizmaster, as I said before, I cannot see any reason why you will not permit it on a 3 phase 4 wire system where the neutral is earthed to the transformer only.

MR. KANE (Johannesburg): I think Mr. Downie (of Cape Town) has covered most of the points, except that I don't know of any electrode boiler (and we haven't had many installations) that doesn't warrant a transformer supply, in other words an H.T. Consumer.

THE QUIZMASTER: Having disposed of that question, we will now go on to No. 5 — Financial Arrangements. Over to you panel.

Question No. 5:

FINANCIAL ARRANGEMENTS

"While the Provincial Power Ordinances and the Electricity Act make it incumbent upon a Supply Authority or Licensed Undertaking to supply electricity within its area of supply to every applicant who is in a position to make *satisfactory* arrangements for payment therefor, no indication is given as to what might constitute "satisfactory arrangements".

Do members consider that a guarantee to pay for electricity at tariff rates with a monthly minimum and/or fixed charge that will cover interest and redemption on the Capital cost of the mains extension, is reasonable and sufficient or could the Supply Authority require the prospective consumer to finance the extension entirely at the outset irrespective of ultimate ownership and any arrangements which

may or may not be made to reimburse the applicant?"

Mr. SIBSON (Bulawayo): The answer to this question depends somewhat on whether the consumer is an individual remote from any other consumer or whether he is a member of a Group, or in other words, whether the risk can be diversified. If one had a very long line to run for a single consumer I think the Council would be entitled to require a substantial guarantee.

If the line is being run to a number of consumers, or if the area was one where development was likely, the individual consumers liability could, I think, be adequately covered by the usual provision of a connection fee, and the usual monthly minimum charge. That is our policy, and in our own licensed area of supply (practically the whole of it is now reticulated) we seldom have to run long lines for individual consumers, and we have no guarantee whatever now other than the initial connection fee and a carefully calculated minimum charge.

Mr. KANE (Johannesburg): I think frankly Mr. Sibson has covered the whole question. I would like to add that either methods of making the prospective consumer or reticulation pay for the capital expenses would be acceptable, and I would hate to see the day that any Act attempts to define what is a satisfactory arrangement. I think you have a tendency in one of the sections of the Electricity Act, if the Commission wants to take over any particular undertaking, I think they define there on what basis they will negotiate.

But you will still have a long battle with it just the same. It has got to be, of necessity, very general.

Mr. BURGER (Paarl): Mr. Quizmaster, this question here is answered by Section 27 of the Electricity Act which says that every Licensee shall, up to the limit of electricity which he can generate under, and, subject to the conditions of his licence, supply electricity within the area of supply mentioned in his licence to every applicant who is in a position to make satisfactory arrangements, and sub-section (2) of Section 27 says that in case of undue delay or refusal to supply the applicants

may appeal to the control board. So it is not laid down by the Act what these satisfactory arrangements are, but it is ultimately for the Control Board to decide what they are.

Mr. DOWNIE (Cape Town): Mr. Quizmaster, in Cape Town we work to a very simple arrangement, and it is an arrangement that has worked for many years. If an extension to mains costing over £40 has to be made we are prepared to embark on the extension provided we can get a revenue equal to 20% per annum of the capital outlay. In other words it is related to the fact that in an electricity undertaking you will find that you turn over your capital once in every five years. If we can turn over from any consumer once in every five years the capital outlay that we have incurred in supplying him we are quite satisfied. In other words we ask consumers to guarantee 20% per annum on the capital outlay, and we usually find that within a year we are getting that.

Mr. GRIPPER (Port Elizabeth): Mr. Quizmaster, the panel, to my mind, has answered the question unwittingly. Throughout the discussion they have referred to the guarantee, either a suitable guarantee, or no guarantee, or the minimum, and our worthy Legal Adviser has even referred to the matter as being essential to continue to make this supply without delay if satisfactory arrangements are made for payment. It is that word satisfactory which I admit must not be defined in an Act, but it can go much further than just a degree of guarantee. In other words can a Supply Authority demand complete and total payment for that extension without any prospects of a return, or only prospects of a return in some possibly nebulous way? That is what I understand to be the purport of the question: not just a degree of guarantee, but does the Act require that if the Supply Authority wants the full capital, can that Authority ask for the full capital to be put down? Thank you, Mr. Quizmaster.

THE QUIZMASTER: Any of the panel wish to speak?

Mr. VAN DER WALT (Krugersdorp): Mr. Quizmaster of course the question refers to a licensed undertaking, but in

Krugersdorp we have actually overcome this by actually promulgating a tariff which provides for a sort of guarantee for your capital outlay. It is a formula more or less on that which Mr. Downie of Cape Town said. We want about 20% return on our capital outlay, but I think we have actually promulgated a formula in the tariff that works inside and outside the municipal area.

Mr. DOWNIE (Cape Town): Mr. Quizmaster, there was one case in Cape Town where the prospective consumers could not find all the money and they were prepared to meet the capital outlay. The arrangement we came to with them was that they would pay for the whole lot, and when their revenue became 20% per annum on that capital outlay we took over the installation at a depreciated value. There was a case where we called upon our consumers to lay out the whole of the initial capital which was rather different from our usual arrangement and we bought it from them at a depreciated value when the revenue we got from them exceeded the normal 20%.

Mr. BURGER (Paarl): Mr. Quizmaster, may I just make one point? That is that the question refers to a licensed undertaking. Of course the particular section of the Act would not be applicable to a local authority, I don't know whether the person who formulated the question had perhaps not borne that in mind.

Mr. MILTON (Johannesburg): Well, Mr. Quizmaster, I think we are getting a bit off the question. The question is: we are called upon to make satisfactory arrangements for payment therefore, which is a payment for the electricity, no question of the payment of the assets. In Escom's own view it is a question of taking a commercial risk. So far as I am aware the Control Board has never been asked to adjudicate on a dispute. The Control Board would only come in if there was a dispute. But the satisfactory arrangements we work on are based on a commercial risk, and if it is an extension not likely to be used by any other party, then the cost of laying out the extension plus a cost of recovering the assets with a small amount for depreciation is sufficient

guarantee to cover any out of pocket expenses you are faced with if the consumer fails. At the same time we usually add to that in the form of requirement for payment of two or three months' power accounts from the consumer, so if the consumer does fail during the use of those assets, and you have not had your full return, you can also recover the power accounts which he will probably also be unable to pay.

Those are the type of guarantees that Escom asks for, based on a commercial risk entirely. If you have got a group of consumers where you may lose one and pick up on others, no such guarantee is required.

THE QUIZMASTER: Thank you, Mr. Milton.

THE PRESIDENT: I think there is one point which has been missed here and that is this: that all these regulations and features of the Electricity Supply Act and licences are all based on the fact that there are sufficient loan funds available to invest. Providing you can get a reasonable guarantee on your money they are all based on that. Now I predict, and it has certainly come to pass here, that we haven't got the funds to invest here, no matter whether they have guaranteed to give you a return on your money which will pay for your interest, depreciation, etc. Therefore we come back to what are satisfactory arrangements for payment, and I suggest that these satisfactory arrangements will change over to something like what Mr. Downie has just said, where, if you haven't got the capital at the moment, they will not get supply until that capital is made available by somebody.

It is no use having it in the licence that you must give supply provided they make satisfactory arrangements, because, if you haven't got the finance to put up the distribution system, there is nothing in this world can make you do it. Therefore, you come round again to your satisfactory arrangements: if they can provide the capital until such time as you need it to put up your distribution system, and get your guarantee for your money, then possibly those are satisfactory arrangements, but they must be varied in accordance with the conditions and your own

liabilities and your own availability of loan funds when the supply is required.

THE QUIZMASTER: Thank you, Mr. President. Well, Gentlemen, I think that disposes of No. 5. We will go on to No. 6. I will ask Mr. Kane to open No. 6.

Question No. 6:

EARTH LEAKAGE PROTECTION OF CONSUMERS' PREMISES

"Has any member experience in the use of earth leakage circuit breakers for consumers' premises, and if so, would he give details in general of operating expenses, particularly with regard to the necessity for regular inspection tests, consumer complaints, interference or abuse, faulty breakers caused by lightning and finally any other aspects that may be of interest."

Mr. KANE (Johannesburg): We have no experience of earth leakage protection at all, Mr. Quizmaster.

Frankly, I would like to hear from the audience or other members of the panel. It is a very interesting question, and I would like to hear the experiences of other people. Thank you.

Mr. SIBSON (Bulawayo): I can't really answer the question that has been put. All I can tell you is that I have got an earth leakage switch in my own house and I know personally how it works, but we have not used them to any great extent. There is one danger in the earth leakage switch which occurs to me, and that is it is an extremely sensitive apparatus which will go off under the slightest possible provocation. The most minor leak will set the thing off, and it is a very great temptation, especially for the Electrical Engineer, to disconnect the earth lead rather than look around for the minor fault that is causing the trouble, and then, of course, forget to reconnect it again. I am not suggesting that I have done that but I do say that that danger exists.

The cost of the switch is, of course, the important factor. It is rather a waste to put in an earth leakage switch which is no more than that. Nowadays it is becoming fairly common practice to employ overload switches rather than fuses. These mini-switches one can now get, from the point of

view of meter protection if nothing else, and we are standardised now on the use of thermal overload switches. These are combined thermal and magnetic overload switches which have paid for themselves over and over again by protection they give to meters under lightning conditions; and, if one was going to use earth leakage as well, it should obviously be combined in one switch and so what one would have to face would be an overload and earth leakage switch if you are going to do the job properly. And I think the earth leakage characteristic would add materially to the cost of the switch, and would probably not justify itself in practice.

Mr. POWELL (Johannesburg): Mr. Quizmaster, Gentlemen, I personally have had no experience with earth leakage breakers. I view these with disfavour and line these up with the use of maximum demand indicators in consumers' premises. I think by the use of earth leakage breakers we are trying to introduce intricacies of supply engineering into the consumers' premises, and if there is another means of protecting the consumer's installation without introducing this complication, then I suggest that that is the better path to follow.

THE QUIZMASTER: Thank you, Mr. Powell. Any members of the floor wish to speak?

Mr. GRIPPER (Port Elizabeth): Mr. Quizmaster, I would say that, like Mr. Sibson, I have also had an earth leakage switch in the house just to see what would happen, and incidentally gave myself a shock deliberately and it cut out. If there is a reasonably good earth anywhere around in the district, then I say such switches are not worth the expense and the necessity to check them frequently. But the purpose of them is to protect human life against excess potential. You can get excess potential without an overload current, and, consequently, rather than rely on a fuse blowing with a poor earth connection, where you may have 200 or 300 volts and the fuse still refuses to blow, but the poor fellow is dead. So that I would only recommend earth leakage protection in such instances as an isolated house out in the Kalahari. Thank you, Mr. Quizmaster.

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THE QUIZMASTER: Gentlemen, I think that disposes of the item, I must be brief. Yes Mr. Fraser?

Mr. FRASER (Johannesburg): Mr. Quizmaster, this is a very vital problem which the Safety Precautions Committee have been dealing with for some considerable time.

At our last meeting it was recommended that we request the A.M.E.U. to investigate the ways and means of making earth leakage voltage trippings successful under South African conditions, and, as you know, South African conditions are entirely different to the overseas conditions. It was going to be, and it probably will be, the duty of the sub-committee to circularise members of the Association. Hearing the remarks which so far have been made, I wonder, Sir, if you could take a "snap" vote as to who has the experience and are prepared to give this committee the benefit of their experience.

THE QUIZMASTER: Any members present who have had experience of earth leakage protection, will they please put up their hands.

Mr. Stevens, Ladysmith; Mr. Muller, Bloemfontein; Mr. Martinson, Witbank, E.S.C.; Mr. Rossler, Cradock; Mr. Lombard, Germiston. I think that is all. Thank you, Gentlemen.

Gentlemen, I have a few questions that were handed to me after I arrived here. I also have a few that were handed to me as I left the Union. I will read them out to you and put them over to the panel.

Question No. 7:

REGISTRATION OF ELECTRICAL WIREMEN

"A perplexing problem faced by the Northern Rhodesia Municipalities is how can we enforce the registration of electrical wiremen?"

As the Rhodesias are now federated, I do feel this could be satisfactorily assured by the forum."

I think Mr. Sibson could probably help me in that matter.

Mr. SIBSON (Bulawayo): Mr. Quizmaster, I am afraid that I am a bit of a

Bolshi on this subject, and I am going to recommend to the enquirer that he doesn't press for the registration or the licensing of wiremen. There are many pros and cons to this matter, and it will be a surprise to most of you who have been living in a atmosphere of registration for a number of years to think that one of your members doesn't agree with it. But I feel that, as far as municipal control of wiring is concerned, the larger municipalities can employ, and do employ, a fairly highly qualified staff of Installation Inspectors who can quite easily ensure that wiring is being done to the standards that are laid down.

If any of these smaller municipalities are unable to afford the necessary staff for this job, then perhaps in that case there could be some Government provision for Inspectors to be made available for them. But I do not think there are many municipalities so small that they cannot afford at least one qualified Installation Inspector.

This method is far better than tying ourselves to external controls on this matter. There are certain minor local differences that have to be taken into account, and, generally speaking, we in Bulawayo have never, (well, not since I have been there) had any licensing of wiremen, and as long as I can resist it I shall do so.

There is another special reason for this attitude and it is especially applicable to Rhodesia. I don't know much about Northern Rhodesia, but in the south a very large number of houses that are built are built by self builders. The cost of living here is very high, and the cost of labour in the building industry is amongst the highest; and there are numerous people who want to build a house, but who just can't afford to pay 9/- and more an hour to a bricklayer and other allied trades for the rather restricted labour output that seems to be customary in those circles, and whose only means of obtaining a house at all is to either build it themselves at weekends (which is a very common sport in this country), or, perhaps employ Native masons to do rough stone work, and another Native to sling a thatch roof on the top, and they do their plumbing themselves probably. There is a great danger that if we got too tied up with regulations

about the licensing and registration of wiremen and contractors that such a man would find that he could not get his house wired, because the only people who are permitted to do so would adopt, or could adopt, the Trade Union attitude of refusing to work on premises which have not been worked on by their Trade Union fellows. I can see a great danger there of forcing the cost of living still higher in this country, and as long as we have adequate installation inspection services, which we have at the moment, which are quite able and adequately to look after the quality and the work, so long shall I resist the licensing of wiremen.

Mr. KANE (Johannesburg): I think the question refers to licenced electricians or wiremen, and I am inclined to agree with Mr. Sibson. It has always amazed me why we go to the trouble of licensing wiremen and licensing contractors.

It is some relic of the past, I suppose, of some municipalities; certainly municipalities had that right in the olden days. I would say to Northern Rhodesia, or whoever it is, that they should make haste very slowly; rather concentrate on control to a certain extent. Control the people in some way that will tell you what they are doing. Then either the Insurance people or you (I think it will have to be you) will do inspections. If you are forced to control anybody then control the Contractors.

THE PRESIDENT: After listening at the Executive Council to the troubles South Africa have in regard to registration of wiremen and contractors, I am with Mr. Sibson all the way. You have also had trouble I understand in inspecting work which has been done by Government electricians, Railway electricians, etc. Well we have no trouble like that. We go in and inspect wherever our supply is going, and if we do not like the wiring we see inside, we do not connect it. It doesn't matter to us who has done it, whether he is an amateur, an ordinary ham, or the finest Government electrician. If we don't like the work he has done, we don't care whether he is registered, whether the contractor is registered, whether he is in the Government, we just don't connect. That is all there is to it.

I suggest to Northern Rhodesia that they retain that power in their hands as long as ever they can, and don't go for what really is a closed shop, often enough forced upon the Supply Authorities or other authorities by Trade Unions.

Mr. QUIZMASTER: Thank you. And now on to the next question.

Question No. 8:

EARTH FAULT FAILS TO TRIP THE BREAKER

"During a recent wind storm in a Northern Transvaal Town, one of the phases was short circuited on the railway cradle crossing.

This caused the stay to become alive and without causing the breaker to trip.

A calf was killed and in spite of this the circuit breaker did not trip.

The load on the ammeter at the power station varied about 50 amperes on this phase, this was encountered on a 380 volt supply.

The two steel poles on either side of the cradle were alive, and in spite of the whole area being damp and to the extent that a pool of water was adjacent to one of the poles.

Why did the circuit breaker not trip?

Mr. SIBSON (Bulawayo): Well of course, the circuit breaker may have been faulty, but it is a situation that can arise if the earthing resistance is too high. You can get a considerable flow of current which can be lethal, or cause metal to rise to lethal voltages, without necessarily tripping an earth trip on a circuit breaker. Well, I think I have told this conference before, have adopted the policy of earthing our neutral at every pole, and ensuring that every piece of metal in the circuit is connected to the neutral. The neutral is a duplicate neutral, so that there is no such thing as an earth fault. Every fault we have is a phase to neutral fault, or a phase to phase fault. I am referring of course to low tension lines, and this sort of situation today just could not arise, because you get a direct short circuit if a line comes down, or a jumper touches a cross arm or anything of that sort happens.

Although I think there is a certain diffidence about this in the Union due to certain regulations, I am quite certain that it is the safest possible method of assuring that no earth metal, or reputedly earth metal, ever arises to a lethal potential.

Mr. POWELL (Johannesburg): Mr. Quizmaster, I subscribe to Mr. Sibson's point of view, and the only other alternative is to put in a thing you were talking about under Item 6: that is earth leakage protection at the substation if you are not prepared to use protective multiple earthing described by Mr. Sibson.

Mr. KANE (Johannesburg): If I understand the question correctly, we are not told of the size of the breaker or what the setting was reputed to be, or whether perhaps the breaker was buried inside an ant heap.

I don't see how we can answer that question really, particularly when they refer to something like 50 amps on the ammeters. There have been cases, I know, in the Transvaal, where the protection has failed to operate on an earth fault; but you invariably find that the breakers have been set up, and set up, that even with a good earth, or a reasonably good earth, the breaker setting, the overload setting, or any setting is higher than the actual fault current.

Mr. VAN DER WALT (Krugersdorp): Mr. Quizmaster, I fully subscribe to the previous views as well. We cannot answer this question unless we have full data including a sketch of the lay-out, and it is doubtful if, as Mr. Sibson says, the circuit breaker may have been at fault, but the earth impedance may have been too large. I just want to add that an animal on four hooves is very easily electrocuted by electricity, probably a human being would not be electrocuted. Animals, like cattle, horses, donkeys, etc., are very easily killed. Thank you.

Mr. QUIZMASTER: I think that disposes of the item Gentlemen, there are a few more small ones and then we come to rather a long one.

As our time is very short now, I will have to cut a number of the questions out, but you are all waiting for one question. We are indeed grateful to Mr. Mathews for

presenting a review of troubles on 11 kV. cable. You all have copies, I presume; they have been put on the table. We are not discussing that at all. We are discussing a list of questions I have received by post, and I will put them to the panel and you will all have to be very brief because we have got exactly 10 minutes. Here are a few of the questions, I will read the questions out if the panel will make a note of them and then over to them.

(1) "Has it been noticed that the failures, this in regard to 11 kV. cable, that the failures originate from inside the cables, that is from the conductors themselves?"

(2) "Was it noticed that the breakdown originates in the small oil spaces between strands and eats away the adjacent paper ending up further away from the conductor as a pin-hole and eventually a flash-over?"

(3) "Has anyone noticed a green discoloration in places on the conductor?"

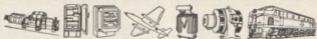
(4) "What does the panel think of the conductor shape? Is it a smooth sector shape without any deformation of the individual strand cross section, or is it a very flat oval, comparatively sharp at the edges and with the individual strands very far from being circular?"

(5) "Has anyone checked the compound for impurities?"

(6) "Has anyone noticed that sometimes the fillers or wormings instead of being neatly placed in gaps at the centre, and corners, of the shaped conductors, are pressed in between the conductors, leaving oil gaps near the corners of the conductors and voids in the belting."

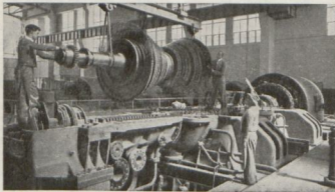
There is a footnote: It may be that many engineers now have doubts in their minds on the serviceability of 11 kV. cables made to BS 480, but the fact is that there are enormous quantities of cable made to this Specification in satisfactory service overseas. I am wondering if anyone has been investigating these difficulties and can tell us anything interesting they have found. Over to the panel.

Mr. DOWNIE (Cape Town): Mr. Quizmaster, I suggest that everyone of us takes these questions back to our jobs, and carries out investigations and asks questions of our Distribution Engineers, and sends them to the Secretary. Compile a list of all



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the answers and then circulate the information amongst all our members. It is a rather tough proposition to answer all these questions. Now our Distribution Engineers may be able to answer them, but to expect us to answer all that lot now, well, we won't get to any Dance to-night!

(Laughter.)

Mr. POWELL (Johannesburg): I would suggest that all these questions be sent to the people who have contributed to Mr. Marshall's (I think it is) Summary and perhaps Standards Bureau, and then a summary provided.

Mr. SIBSON (Bulawayo): Mr. Quizmaster, I started writing down all the answers to the questions. My answer to No. 1 was 'Yes'; my answer to No. 2 was 'Yes'; my answer to No. 3 was 'No'; and then I got a bit tired (laughter). But I do want to suggest that one might dwell a bit too much on detail here.

I think the answer to the whole question is simply that the specification has been reduced to such a stage that something is bound to go. Whether this is caused by questions 1, 2, 3, 5, 6 or 7 is not so important as the fact that cable built to such a better specification does not fail. You may remember the old days of Spec. 7, much of which cable is still in use, and I am not aware of any troubles of the sort that are now disturbing us taking place in that Specification.

Today, nobody in their wits would dream of specifying Spec. 480 for 11 kV. cables, and we are constantly using Spec. 760 which is not quite as good as Spec. 7, but it has so far given no trouble at all. I am sure that this microscopic examination of the minute details that might give rise to it is really irrelevant. The real question is that the stuff has been cut down too much.

The reason why it gives more trouble in this country than anywhere else is due to the wide fluctuations of temperature, which is an additional abnormality. I think many of the members of this Convention have been remarking on the extremely warm days and extremely cold nights that you are experiencing here. It is probably worse here than in many parts of Africa. But we certainly do suffer from, or enjoy perhaps, much wider changes of temperature over

shorter periods in Africa than is common in Britain. I think that is one of the differences that may give rise to an earlier failure of this cable.

But in fact there have been troubles in Britain too, and there have been troubles in Australia that we know of, and I am satisfied that we have gone just a little bit too far in cutting down to meet competition, and that Spec. 480 is no longer to be regarded as an adequate specification for 11 kV. cable.

THE QUIZMASTER: Thank you, Mr. Sibson. Mr. Mathews will you come up.

While he is coming to the mike, there is more in the question than meets the eye, and I think the information should be submitted it would be to the benefit of all engineers in this country.

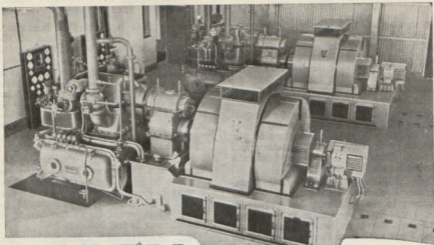
Mr. MATHEWS (Kimberley): Mr. Quizmaster, I am in full agreement with Mr. Sibson. I think I have made that point clear in the resumé at the end of the notes which I have placed before you. I still don't think that Spec. 760 is going to be the final answer. I think you are only prolonging the trouble by use of BS 760, or its South African equivalent. I think that the problem has to be tackled by the cable designers so as to prevent void formation. Thank you.

THE QUIZMASTER: Mr. Middlecote is here, he wishes to contribute to the discussion. You have $\frac{3}{4}$ minute Mr. Middlecote. (Laughter.)

Mr. MIDDLECOTE (Pretoria): I think that with great confidence one can put the major portion of the failures of cables, shall we say on the shyness of paper cables, as Mr. Sibson has pointed out, but it would be a mistake to go to the other extreme and make them abnormally thick. There are other ways.

There are ways of going in for oil filled end boxes or semi-fluid end boxes. The big thing is to stop this ionisation taking a nasty turn. Whilst I have a couple of minutes I would just like to give the answers to a couple of questions.

The green marks on the copper are a form of copper nitrate. The paper attached is only when the oil has vanished to a terrific degree. Normally if the oil was there the ionisation would wax the oil, and



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almost self seal it. That is why, under normal temperature variations probably the ionisation voids would not lead to a lot of trouble, but when you have got a terrific gravity pull away of oil, you are so lacking in oil that the ionisation taking place in these voids forms other chemicals and attacks the copper where you get a form of Hydral Nitrate I think it is. Our people analysed it. On the other hand the possible chemicals which form in the voids attack the paper and you get these chlorides. They are very difficult to see unless you wash the paper, but I would like to reiterate not only must we possibly increase the functions of the paper on the cable, but do not let's lose sight of our function as engineers and that is to keep costs down. In certain cases there is a simpler approach, and that is suitable end box design.

THE QUIZMASTER: Gentlemen, I can't allow any further discussion. I see the President is on his way up, our time is expired. But I think we are all very grateful, and appreciative, of the way our panel have come forward to handle this problem and answer these questions for us. Gentlemen, I will now hand the position back to the President. (Applause.)

THE PRESIDENT: Gentlemen, as I said before this, to me, and, I hope, to you, has been a very, very interesting afternoon. I think we are very greatly indebted to the panel which you have had on this platform this afternoon, and I am going to ask you to express a vote of thanks to them in the usual way. (Applause.) I notice none of them got up and bowed. Well I shall have to adjourn this Convention now until tomorrow morning, and don't be late. Thank you.

THIRD DAY

Wednesday—9.30 a.m.

THE PRESIDENT: Will Mr. Hugo please join us on the platform and Mr. Muller. I don't see why we shouldn't see your handsome faces.

Good morning, Gentlemen, we are a little late this morning, but I presume you are all a bit blery-eyed, or are you?

As you knew, we have got quite a lot to get through. I am going to make one or two announcements then I am going to go straight into Mr. Yodaiken's paper. We shall have the proposer and seconder of that paper, but then, so that we can definitely get through the business of the

meeting, I am going on to the Reports. We shall then see what time is left for actual discussion on both Mr. Lynch's and Mr. Yodaiken's papers, and any further questions which should have come up in the Forum. I think that should be the correct order because, when all is said and done, as regards discussion, written answers can always be given in the proceedings. I hope I have your agreement to go forward in that manner because I think that is the only way we can possibly get through by Thursday lunch time.

I am now going to call upon Mr. Yodaiken to read his paper on "Some Aspects of the Work and Difficulties Confronting the Small Community Electrical Engineer."

Mr. YODAIKEN (Que Que): Mr. President and Gentlemen,

I wish at the outset to express my thanks to our Executive for the opportunity which has been given to me of outlining in brief the problems which confront the small community Electrical Engineer, and to enable me to cover aspects of his work which I consider of particular interest. This it is felt is long overdue, and although our colleagues in larger urban areas have no doubt passed through similar phases of expansion to those at present being experienced by towns in various stages of growth, with the associated problems, times were different then and therefore the steps taken to solve various problems were consequently different. In large towns electricity departments are in themselves departmentalised and the City Electrical Engineer does not have as close an association with the actuality of the various aspects of the work that the small community engineer experiences.

It is therefore my intention to divide the total work of the engineer under a number of subheadings and to discuss these aspects of his work without comparison with larger towns.

By the very fact that the community is small, the engineer must cope at first hand with the following aspects of his work:

1. Distribution.
2. Generation.
3. Metering and Testing.
4. Council and Councillors.
5. Bye Laws.
6. Public Relations.
7. Tariffs.
8. Staff.
9. Capital Works and Maintenance.

1. DISTRIBUTION.

In considering this aspect of the work one must first decide why a small town is not a large town. There are a number of reasons which immediately spring to mind.

- (a) It is a newly established town—post-war built, small, but growing rapidly—a town such as that established on the Goldfields in the Orange Free State.
- (b) The town is fairly old—came into existence as a result of one particular industry or cause and whose growth has resultantly been slow.

- (c) The town is small due to lack of foresight of its councillors, or timidity regarding the provision of essentials, or a combination of both.

I do not wish to quote any other reasons but no doubt considered from the various other angles such as agriculturally, industrially or politically, additional reasons can be quoted.

The problems relating to towns classified under (a) above will not be dealt with here and only those relating to (b) and (c) above have been studied, and I ask for forgiveness if in doing so, some little of the history of Que Que is quoted in illustrating various points.

The establishment of a large mine some 50 years ago resulted in the development of a small town on its fringes, whose services including electricity were supplied by the mine. The system of production being based as it is on a steady rate over a long period of time, has resulted in no contribution to local expansion except for the initial stage. Thus up to the end of the last war, little or no expansion other than that resulting from the growth of other areas of country had been experienced. By this it is meant for example a gradually increased railway staff as a result of railway expansion, but not due to the town's growth. But this gradual expansion had resulted in a changeover in 1935 to supply of electricity by the Electricity Supply Commission and the gradual extension of mains and distribution since then without any forethought or design—overhead lines extended with v.i.r. or galvanised iron wire, H.T. and L.T. mains on the same poles in the town area, and overloaded substations and lines. I can honestly say that I think Que Que can claim the doubtful honour of having had the only L.T. system in which every size of bare copper and v.i.r. available was connected in series in varying lengths.

The stage was reached eventually in 1950/51 where something had to be done. The phase to neutral voltage though nominally 220 volts was actually 165 volts, and the all time low was 132 volts. The importance and urgency of a new system, and the essentiality of the replacement of sub-

stations which, apart from being overloaded, were death traps, was desperate. At the same time, the whole approach by the Council to the question of providing services was receiving a bad jolt. Post-war national expansion resulted in many industrialists requesting services which could not be provided. With no electricity department and thus no qualified staff to help, many opportunities were lost.

However, consultants were called in and a new system designed and installed, with an H.T. and L.T. reticulation which will enable adequate expansion.

So much for the history of this small community which I feel is not greatly different from that of very many towns in Southern Africa.

Now it must be appreciated that prior to this time no electricity department had existed and electricity supply was regarded as a small portion of the town engineer's work. So that in considering the various aspects of the engineers work, I have been fortunate in having formed the Department in Que Que from inception and in having experienced the growing pains and problems up to the present time.

With this slight digression for the purpose of rounding out the picture, a return to the problem is indicated and in this respect expansion brought about by a steadily increasing demand is very nice, but when a state has been reached where renovation is necessary as a result of the existing state of affairs and additional demand cannot be added before renovations have at least commenced, the attendant problems are altered. In a period of long deliveries, and rising costs will the additional demand be available when the system has been improved? The answer is usually — No. The post-war expansion could not wait for unprepared communities.

With the sudden formation of a department, the engineer has to face the problem of the number of staff to adequately service and maintain a new system, to ensure that the maximum life and efficiency is obtained from the equipment purchased, and also to have available staff capable of coping with any expansion which comes

along, without any records, statistics, or information on which to base his judgment. At the same time, speed is essential to complete the new system. The manner in which this aspect was tackled was to put out the H.T. reticulation, substations, and associated equipment to contract and to undertake the L.T. distribution and maintenance departmentally. In this manner, an adequate labour force was established and essential equipment for subsequent use was purchased while the electricity department was properly organised and a transport pool obtained. I do not advocate this as a policy for similarly placed towns to adopt, but this was the one which expediency indicated was the best in the circumstances.

Up to this point no mention has been made of finance. To the small community engineer this is the most important aspect of the work.

The initial distribution system in a township is the basis of all future expansion, and this system must therefore allow for a fair degree of load increase. Considering Figure 1, it must be seen that from 1946 to 1956 the annual unit consumption has increased from 200,000 units annually to 5,500,000 units annually. This rate of increase justifies a large degree of load provision for the future. But the capital cost and the amount of interest and redemption to be paid by the ratepayer in order to provide this insurance for the future is one of the basic problems of the small community engineer's work. The system as it exists at present has cost £160,000 and gives adequate provision for load increases up to 8 or 9 times the present load. The same system allowing only, shall we say, for 100% increase may have been considered sufficient and then the cost would only have been in the neighbourhood of £100,000. Thus a capital cost increase of 60% had to be considered. No large town would ever be confronted with such percentages. Quantities in small towns are not large, but percentages are, and the Engineer must consider the percentages.

The further problems of expansion will be considered under Section 9, and for the time being other aspects will be examined.

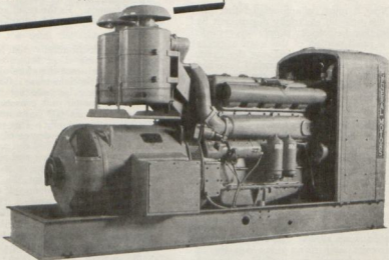
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2. GENERATION.

As has already been indicated, supply in this instance is obtained in bulk from the Electricity Supply Commission, and this aspect is considered under the heading of generation. In all my experience of the Electricity Supply Commission, I have had nothing but co-operation and in every manner has both the Commission and its staff demonstrated its eagerness to be helpful on every occasion, and therefore, my remarks are not meant to be derogatory in any way. But the greatest drawback of

taking supply from the Electricity Supply Commission is the rate of expansion of this body. This rate of expansion has resulted in methods of protection which are, in my opinion, outmoded and which do not allow any latitude or leeway. The protection settings insisted upon or necessary in order to give discrimination between the Town's incoming breakers and the E.S.C.'s feeder breakers at their M.S.D. Substation are so low that adequate discrimination over the town's distribution system is virtually impossible. But in this respect all the blame

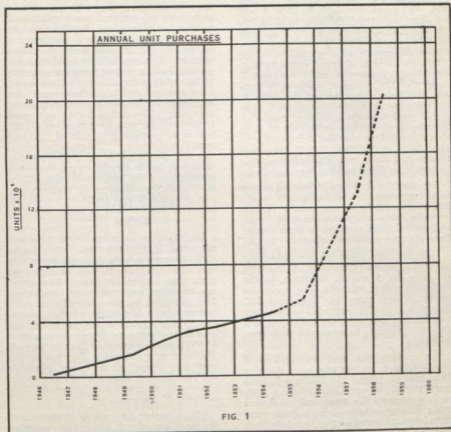


FIG. 1

must not be laid at the E.S.C.'s door because it is possible in many cases that protection on the town's network has been insufficiently studied or inadequately designed.

However, to quote our own case, the E.S.C.'s protection settings on their feeder breakers to our bus-bars are set for a minimum tripping time of 1.1 seconds on overload and .84 seconds on earth leakage, and the town's incoming breakers have corresponding minimum tripping times of .66 seconds and .44 seconds respectively.

With times of .66 seconds for overload and .44 seconds for earth leakage, it will be seen that great difficulty will be experienced on any system which is likely to be fairly extensive and to combine a number of different types of protective equipment, and the loss of almost complete rings have been experienced under fault conditions with the attendant difficulty of locating the area of trouble and the delay in restoring service to all areas affected. The E.S.C. unfortunately with the lengths of lines involved and the multiplicity of large step down substations find it impossible to alter these settings and the situation will remain such until more discriminating protection is available and has been installed.

The other disadvantage of drawing supply from this source is that being in a severe lightning area, faults on lengths of line between towns affect more than one town and often lightning surges in areas remote from any one town will affect the supply.

This has the effect of increasing the number of annual interruptions to the town and can be a source of strain to the engineer's public relations. The reason for power failure given as "Due to E.S.C. failure" is very often regarded as an excuse to hide the shortcomings of the department and their inability to cope with their commitments.

For example, the total interruptions of supply wholly or partially over the past 18 months have been 25. Of these 12 have been partial interruptions affecting only various areas of the town and all due to cable failures, while 13 have been complete interruptions affecting the whole town due to E.S.C. interruptions. It is therefore seen, especially since of the E.S.C. inter-

ruptions only two could be classified as outside the lightning season, the effect that surges and suchlike on the system have on the supply to one town. It is stated, however, in passing that all of the E.S.C. interruptions were of short duration, but the fact remains that the small community Engineer has to cope with the results of both E.S.C. and town failures.

3. METERING AND TESTING.

A small community often finds that it lacks certain essential testing equipment. As I have already said, the E.S.C. are always co-operative, they will test oil samples, filter oil and numerous other small services are often given, but the time perhaps will come when their equipment is in use in districts and therefore unprocurable. This can be very embarrassing to say the least, and it is therefore necessary to formulate a list of essential test equipment required and to purchase same. Immediately the bug-bear of cost raises its ugly head. The cost of testing equipment of various types may not exceed say £5,000 but what percentage is this of the total capital investment? A sum of money of this sort can be lost in say a power station extension, but it may be a very reasonable percentage of the total capital expenditure of a small department. All engineers desire adequate testing facilities but the engineer in this case has to break down the list to essentials first.

On one occasion a length of cable was suspected of being faulty. With inadequate testing equipment, it was impossible to disclose any fault. Mobile testing equipment was loaned by one of the larger municipalities and tests were conducted. The suspected length, although it carried current until a few minutes before testing, was in fact proved to be faulty, and on locating the fault a completely disintegrated 11 kV. through joint cable box was located. The area was extremely dry, but in the next rainy season had the source of trouble not been located, failure would have taken place and a completely erroneous idea obtained of the cause.

I have quoted this case to illustrate that the engineer, if not adequately provided with test equipment, is unable to ascertain the true causes of failure or to be sure that

the steps taken to prevent repetition of the fault are in fact the best.

To quote another example, I was a short while ago in discussion with an engineer on the subject of cable failures, and was informed that he had experienced a number of cable end box failures. This department had had the questionnaire from Kimberley, but the community is a small isolated one and this engineer had not had the opportunity of discussion with any colleagues and had a very doubtful cause for his cable failures.

Continuity of supply is the main object of any department. Although the supply of electricity is the youngest service offered to ratepayers it has nevertheless assumed a domestic, commercial and industrial importance far exceeding the widest dreams of its earlier protagonists, and while I do not wish to repeat the remarks made by previous contributors, the importance of the supply cannot be too often emphasised.

One of the biggest drawbacks to being a small community engineer is the lack of consultants. By that I do not mean consulting engineers but other electrical engineers with whom problems of mutual interest can be discussed. Cable faults have just been mentioned. Let me quote another example. Strain insulators on high tension overhead lines for example may be of glass or porcelain. One point which is worth considering is this. Glass, when struck by a rifle bullet or a stone from a catapult, makes a sound delightful to the ears of small boys and some not such small boys, but anyhow, it shatters, while porcelain chips more often than not. The experience of engineers in charge of large rural distribution systems, is of value in ascertaining the peculiar properties of one product when compared with another.

The engineer in the small community, however, cannot back his decisions by experience very often. Even technical assistants could be of inestimable value in bringing to bear a different approach to a particular problem. While the engineer need not lack confidence in himself or the decisions and designs which he produces, how much easier and simpler would it be if he was not the only available individual. I would therefore take this opportunity of

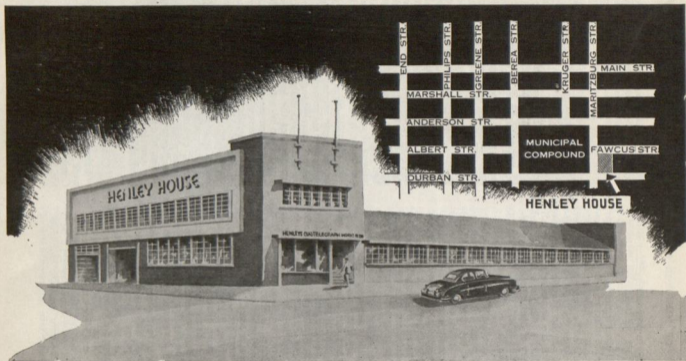
requesting that consideration be given to the circulation of statistical data on materials, equipment, and etc., between members of this Association to the betterment of all systems and undertakings.

The next essential of electricity supply is that the consumer shall not pay for what he has not received and further, that there shall be no public contribution to individual costs. Thus accurate metering equipment is essential, irrespective of town size. In this case no meters had been tested since 1935, and probably not then, 50 meters rated to operate on 60 cycles were found installed and numerous other deficiencies. In small communities where the public are suspicious of each and every innovation, the establishment of adequate meter testing facilities is the first step to gaining public confidence and towards establishing the integrity of the department. In addition, the existence of a small meter testing department will be the basis of the growth of the test department of the future. The engineer, however, has the responsibility of deciding which comes first and of convincing his Council accordingly.

In a community of small consumers, the normal house service single or polyphase meter does not present difficulties. But since the tariff payable to the bulk suppliers will be a two-part m.d. and unit tariff, the expansion of the town will result in the introduction of a two-part tariff to larger industrial consumers. In addition, increasing load means changing current transformers, rescaling ammeters, and numerous other tasks which only adequate equipment can handle. Sending instruments and meters away for calibration and adjustment has disadvantages due to transport damage, altered climatic conditions and etc. The necessity for adequate equipment in even a small community is obvious and the production of a meter testing code of practice for use in Southern Africa would be invaluable assistance.

4. COUNCIL AND COUNCILLORS.

In broaching this aspect of the Engineer's work, let me say at the outset that many Councils and Councillors do not appreciate the fact that they serve the Council in an honorary capacity and can retire at will,



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while the staff serve the Council as a career. It is therefore not often appreciated that an engineer's recommendation may very well be one which could have a very considerable bearing on his future career. Neither do Councillors appreciate the position in which the engineer is placed. He knows that it is perfectly easy to confuse his councillors by the production of such terms as kVA., load factor, and etc., and he also knows that if the shoulder shrug is eloquent enough, he can easily create the impression that no further advice can be given and if his is not accepted, he cannot be held responsible for the results. Knowing that he is dealing with, for the most part, conservative, uninformed people, over whom he has a distinct advantage technically, the added responsibility is placed upon his shoulders of not overtaxing council with problems and of only asking for absolute essentials, while at the same time he also knows that he can err on the wrong side and thus jeopardise his department's efficiency.

In small towns, the relationship between Councillors and heads of departments are far closer than elsewhere. Hail fellow well met may be the order of the day, but the pitfalls of not choosing a path midway between such a state and aloofness are too numerous to mention, and in addition personalities are far more likely to clash.

It is the engineer's duty to realise that Council are a body of people who, when discussing problems and policy, are not in a position to analyse the technical aspects. Their approach to say the problem of expansion may be one of expediency while the engineer's approach must be on the sound basis of further future expansion. At the same time, Councillors are a cross-section of the community ranging from over optimism and enthusiasm to over pessimism and the inability to make a final decision. The opposition of opinions and policy can be a very sore trial to the engineer who, because of the size of the community, has very close relations with Councillors. However, must are well intentioned and take their honorary work very seriously.

5. BYE LAWS.

The desire to have modern bye laws is felt when a town gets to the point where a

modern system becomes operative. Before this, very often only a sketchy set of rules rather than bye laws exist and the player can either obey the rules or make his own, it doesn't much matter which, since there is no departmental check on the activities of the public. Thus the electrical engineer has to commence his law career. If he is enterprising enough to start from scratch and compose his own set of bye laws then I say good luck to him. The manner in which to go about it is to obtain copies of other municipalities' bye laws, study them, pick holes in them, take out the best bits of them, leave out what is considered superfluous and from the whole compile a set of bye laws and submit them for consideration. The first obstacle which has to be overcome is the Council, half of whom can see no necessity for having bye laws at all and who disagree with each and every clause. Having successfully handled the Council the next step is to have them promulgated. The Government Law Officers have ideas on the subject which are completely at odds with our young lawyer, who discovers to his horror that even the capital letter has more significance than he had ever hitherto assigned to it.

Eventually, after a very lengthy correspondence and much re-writing, the job is finished and the bye laws are promulgated, satisfying nobody in their final form—least of all the electrical engineer. The fact that reference to British, South African or other standards is not permissible and that reference to codes of practice is eliminated, means that in order to produce a document which is of real value to the public, the Council would have to employ a full time group of lawyers and engineers for a considerable period. This appears to be of no concern to the powers that be. I can understand the attitude of the Government Law Officers but at this stage I would state that the fact that an impasse has been reached is most unsatisfactory. My only immediate solution to the problem is that the Government should promulgate all the necessary Codes of Practice for the country and give Local Authorities the right to enforce them. In the Union of South Africa, the Factories' Act does give authority to place responsibility on the electrical engineer but the same cannot be said for the Federation. In small towns the consumer

is far more likely to query and endeavour to ignore good practice with every opportunity of airing his complaint direct to a Councillor than has his counterpart in a large city or town and the relative importance of consumers is much enhanced in a small town.

Bye laws will always be broken, but when the Council aid and abet in their breaking the difficulties confronting staff become insuperable.

The early existence and promulgation of electricity supply bye laws is really essential for towns in general and particularly small towns. Uniformity of bye-laws throughout the country would also be of benefit to the various communities. Electricity is a service which is simple to install and the advantages of which are many. The ease with which every electric appliance is used or brought into disuse has lulled the public in general into a sense of security. Little or no regard is paid to the potential danger as a result of increased use. The public do not realise that bye laws are produced for their protection. Many a time I have had to inform people that there is no such thing as a temporarily dead man. But the enforcement of good practice on the public is a hard path to hoe and the engineer more often than not being without adequate staff for installation inspection, comes directly in contact with the public in regard to the quality of installations. In small towns it is extremely difficult to obtain the Council's whole-hearted support for sound measures, when it is realised that the individuals themselves who sit on Council, are more likely than not to be put to a fair expense as a result of the enforcement of the bye laws and wiring regulations which are to be promulgated.

6. PUBLIC RELATIONS.

In this sphere of his duties, the engineer comes up against many troublesome tasks. He is aware that he has important duties towards the consumer among which are public and individual safety and continuity of supply.

It is in the endeavour to enforce diplomatically at first the bye-laws and good wiring practice that the first disagreements

arise. "My wiring has been all right for 20 years and there is no reason why it shouldn't last for another 20 years" says a consumer whose geyser is mounted above the bath and is connected into the lighting circuit by means of very ancient household flex. Small towns have a higher percentage of badly wired premises than the large towns, and therefore, a larger percentage of the people are involved in the necessity of renovating old installations. It has always amazed me that people will be prepared to spend a £100,000 on a factory building and yet begrudge the amount of money spent on installing the wiring, etc., in order to bring the factory to life. Tell consumers to boil their water as it is unsafe to drink and they will do so without murmur or question, but tell them to rewire their stoves as if not it may bring instantaneous death, and they are immediately up in arms.

In a small town everyone knows everyone else and the desire of Councillors to do their little bit and demonstrate to the public their efforts often strains these relations to the full. Councillors ought to examine more closely their attitude to staff and to support staff where that support is essential to the good management, efficiency and integrity of the department.

There are many other aspects of public relations angle and I have no doubt that all here could add many points indeed.

Electricity is the youngest service in any town, and it is the silent service. A click of a switch and there is light. As I have already said, the public cannot be convinced of the potential danger of the power they use to provide lighting, cooking and freezing, as well as motive power and the engineer finds that he is advisor to contractors and architects and even to people who, in seeking his advice, have the object in view of breaking the bye laws and engaging in abortive practices.

The engineer finds that he is drawn in virtually as an unpaid consulting engineer to many consumers erecting new buildings and/or factories, and I for one often find it extremely embarrassing when asked whether I prefer one supplier's equipment to another. In the same way consumers often ask which contractor the engineer would advise them to engage. I would on

very rare occasions be prepared to state definitely that I would not be prepared to connect a particular brand of equipment for a particular purpose, to the Council's mains for that particular purpose, but the engineer must always generalise and not particularise when discussing such problems, and the lack of consulting engineers in small towns is an added burden to the department.

7. TARIFFS.

With the establishment of an electricity department for the first time in the history of the town, comprehensive and detailed analysis of the cost of supplying electricity can be made available, and the problem of producing equitable and fairly stable tariffs can be tackled. Prior to this stage, the tariffs no doubt contained anomalies, ambiguities, inequitable charges and downright injustices. Let it be said at this stage that a state of affairs of this sort is not the fault of the staff who advised on and compiled the tariffs as they did not have available the required information.

The compilation of tariffs is not an easy business and the cardinal consideration of equity and fairness, the absolute essential of making an excess of revenue over expenditure and of covering eventualities among many others must be borne in mind and only the engineer in conjunction with the treasury can produce adequate results. However, the engineer has to tackle the problem from another angle. The tariffs produced must, if possible, be such that industry and commerce can consider them one of the attractions of opening up in a small town. Therein lies the snag. The engineer has to endeavour to aid producing conditions which will attract consumers from the larger towns. I do not mean established concerns, but must aid in tipping the scales where new consumers are concerned.

To decrease the industrial tariff to make it attractive may result in an increase of domestic tariff, and as the industrial concerns employ people who as individuals may be required to pay a high domestic tariff, the final balance may be tipped in the wrong direction. The industrialist in raising staff must consider the same aspects

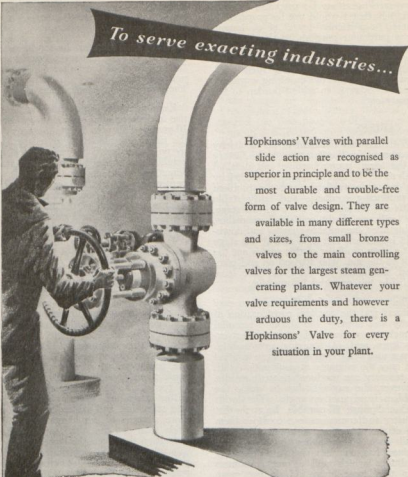
as does the engineer in his requirements of staff. So that all in all a vicious circle is likely to result.

Tariffs must therefore be considered from the point of view that small towns have not the amenities of the larger and must promulgate tariffs likely to compensate to some extent for the lack of these amenities.

Examination of Figure 2 shows the sharp rise in departmental expenditure in the last 10 years. This is to a certain extent due to the increasing electricity purchases, but a by no means small percentage of this expenditure is made up of interest and redemption payments and salaries. The percentage of addition capacity allowed for in the initial installation may constitute a large proportion of the interest and redemption charges, and must be reflected in the final tariffs which the public must pay.

8. STAFF.

This constitutes one of the biggest problems facing the engineer to-day. It is quite safe to say that there is no unemployment in small towns as the unemployed immediately migrate to the larger towns in search of work. Thus there is no reserve pool for the engineer to draw upon for staffing the department. This means that the conditions of service offered by the small town must be sufficiently attractive to draw staff away from towns which have better amenities, superior hospitalisation and schooling and which can offer many more avenues of employment within the trade than can the small town. When it is realised that even the larger towns have difficulty in filling vacancies when competing against the mining industry where in some instances the bonus paid equals basic pay, then the almost insurmountable problem of obtaining reliable staff for the small town can be appreciated. The unfortunate thing is that the Public Service especially for junior staff is not attractive in countries like the Union of South Africa and the Federation where industrial expansion is great at present and likely to continue, so the wastage occurring in public service personnel is of major concern to us all and the small town is at a great disadvantage when endeavouring to attract staff.



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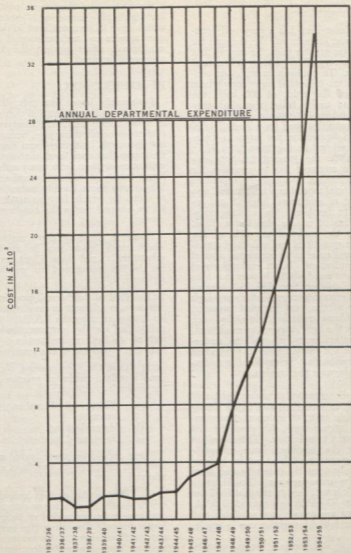


FIG 2

9. CAPITAL WORKS AND MAINTENANCE.

The engineer here has a very real problem. In most large towns the demand for services is far greater than the supply, but the opposite very often pertains in the small community. To quote an example—in connecting up an industrial consumer whose load was of the order of 800 kVA, the decision had to be taken regarding provision for future extensions in this area. The whole was designed for a load of 4,000 kVA. These figures are not large in themselves but related to the town total M.D. of 1,350 kVA, the percentages are very large. The engineer has to consider the aspect of adequate provision for expansion against the total capital expenditure and also the amount of additional interest and redemption to be borne by existing ratepayers. This of course also has a direct relation to the maintenance side of the work. The quantities and values of standby equipment have to be correlated against the total equipment. In an undertaking of the size mentioned above it does not take more than one or two 200 kVA. transformers as spares to represent a very high percentage of the total installed capacity. These problems must be valued by each engineer in the light of peculiar conditions, but the general principle that an undertaking does not carry spares in proportion to its size means that the smaller the undertaking the heavier the burden.

The small community having relatively no engineering workshop and repair facilities is unable in most instances to undertake large repair work, for example, the rewinding of a transformer. Therefore, not only must the engineer have adequate spare equipment available, but he is compelled to rely upon the integrity and good faith of the manufacturer. To illustrate this point, it is sufficient to say that facilities to dry out 500 kVA. or even 200 kVA. transformers are usually not available and therefore no initial inspection can be made.

To analyse still further, the community of Que Que has at present just over 525 consumers. The cost of running the department comes under three main headings: Power Purchased, Interest and Redemp-

tion Payments, and Salaries and Wages. It is the second and third items on the above list which play havoc with estimates and which have to be considered in the light of good service and maintenance of expensive equipment, offset against the individual ratepayer burden.

10. CONCLUSION.

I sincerely hope that this dissertation has not given the impression that engineers in small communities are martyrs to their profession or anything else, because this is not the case. I think I can say that we all enjoy the work and that sympathetic assistance is given from many colleagues in larger towns, as well as Council and public. I have only above tried to instance the type of difficulty which, for the major part can all be lumped under the heading—lack of money.

However, there are three major ways in which small towns can be assisted very substantially, and these I put forward for the bodies concerned to consider very seriously.

(1) That all fairly well populated peri-urban areas adjacent to small towns should be handed over by the E.S.C. to the Municipality for supply purposes under terms suitable to both major parties. This will help the expansion of the town's economy.

(2) That the Government should produce standard codes of practice covering the following subjects:

- (a) Wiring of Premises including factories.
- (b) Meter Testing.
- (c) Overhead Lines.

These should be promulgated and made law, and reference in bye laws should be allowed.

(3) That capital monies loaned to small towns should be at a lower rate of interest and over a longer period of time than for larger towns. Too often the larger towns get the lions share of Government monies and are also allowed to float loans on the open market, while the smaller towns merely get a small percentage of their requirements. In these days of atomic age, I feel that all governments would be doing

their countries a very valuable service and obtaining a good insurance for the future by aiding decentralisation of industry and population by every means at their command.

Finally, I wish to take this opportunity of thanking you for the hearing you have given me and to thank my Council for the assistance they have rendered me and for permission to present this paper.

THE PRESIDENT: Thank you, Mr. Yodaiken for what I think is a typically Rhodesian Paper. (Laughter.)

If you will bear with me I am not going to ask for the proposer and seconder until after the tea break, that will give them a little bit longer to reply to the points made by Mr. Yodaiken which were not in the actual printed paper.

10.30 a.m.—Refreshment Interval

11.00 a.m.—Convention Resumes

THE PRESIDENT: I have two announcements. One is in regard to a resolution of the Executive Council in regard to recognition of the services of Past Presidents. It was suggested at the Executive Council that there should be some recognition given to Past Presidents, and a Sub-committee comprising of the Councillor members of the Executive and Mr. Kane met and recommended that Past Presidents and Honorary Members be presented with a certificate, quarto size, and signed by the President; it was also recommended that they receive a medal, gilt and enamel, with a name and date inscribed thereon, and it was also suggested that the recipient be given the choice of language for the inscription. I don't suppose that any of you have reason to object to that recommendation.

I will now call upon Mr. Stevens to propose a vote of thanks to Mr. Yodaiken for his paper.

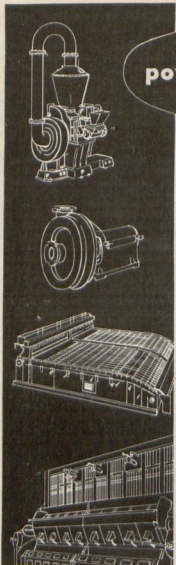
Mr. STEVENS (Ladysmith): Mr. President, Mr. Yodaiken, and Gentlemen, I am very pleased to have the opportunity to propose a vote of thanks to Mr. Yodaiken for his most interesting paper. While reading it through, it brought to mind the troubles I encountered when I was first

appointed Engineer to a comparatively small municipality. I had been 11 years with one of the bigger municipal electricity undertakings in the Union, and became accustomed to working among engineers, superintendents, and inspectors, and with up to date substations, workshops, meter and other testing equipment, so imagined all undertakings were the same in this respect.

You can imagine the rude awakening I had when I found there were none of those, and yet no money to introduce them. As I had lots of grand ideas, the only thing I had to do was put them into effect by degrees, and, in doing so, consider many times the pros and cons regarding the expenditure entailed. I would imagine the Author's experience has been much the same as mine so I can sympathise with him. Having only received the two papers read at this Conference on the 2nd May and leaving for Rhodesia on the 4th it didn't allow time to prepare a contribution to the discussion, so my comments will be few.

I can see no need for having any qualms about having high tension and low tension conductors on the same poles. Regarding the protection it would seem that most bulk consumers are subject to the same restrictions, greater than they consider necessary. I would like to hear what testing equipment the Author considers necessary. I have always been of the opinion that meter testing plant was most desirable. We require all H.T. bulk consumers to supply their own transformers and switch-gear to cut down on the capital to be found by the Council, and as an inducement to consumers to take a H.T. supply allow them a special discount on the low tension bulk tariff, that is when the Council supplies this equipment. In connection with interruptions, we experience 30 and upwards per annum in the supply we receive from Escom. Nearly all of these, however, are momentary, but long enough to cause in the case of one of our bulk consumers 400 motors to stop, and when that happens we are most unpopular although it is no fault of ours.

The paper is one of particular interest to the Engineers of smaller towns, and I hope



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that the discussion that ensues will give them, these gentlemen, an opportunity to state their case. In conclusion it gives me great pleasure in proposing a vote of thanks to Mr. Yodaiken (Que Que): Thank you. (Applause).

THE PRESIDENT: Thank you, Mr. Stevens. Will Mr. Mathews second that please?

Mr. MATHEWS (Kimberley): Mr. President, Mr. Yodaiken, and Gentlemen, I am not sure whether Kimberley has been singled out for the honour of seconding Mr. Yodaiken's paper on the score of being a small town, or because of the complexity of the problems which have beset its electrical engineers. I prefer to believe that it is because of the latter.

In Kimberley we have had the unique experience of two changes in the ownership of the Undertaking. In 1880 the Council first established its own undertaking including the generation of power. In 1904 this was taken over by a Mining Co. who became the generators and suppliers to all consumers in the Municipal area. This Company also acted as consultants and contractors for all small extensions which the City Council required. The Council collected all revenues and in turn paid for energy supplied at the summated total of all the LV meters. It also paid for all extensions carried out.

In 1938, however, the Council re-assumed control of the Undertaking with the exception of the Power Station, which was still retained and operated by the Company. The Council undertaking was placed under the control of an engineer with the injunction that all problems should be resolved as quickly as possible. Since that date it has been necessary to convert the product of 35 years of American mining electrification practice applied to a distribution system to a conventionally designed and operated one.

Mr. Yodaiken has put in print the problems of all small town engineers, who have to be experts in all things electrical, and some not so electrical. I do not understand fully Mr. Yodaiken's difficulties in regard to the protection scheme set out by his suppliers. Adequate discrimination can surely be evolved if care of selection is

made of correct current transformers, relays, and settings. It is desirable, I think, to enlarge upon Mr. Yodaiken's remarks about the Council and Councillors. These Gentlemen are in general very conscious of their duties which they do remarkably well; the success or otherwise of their actions must stem from the manner in which the problems of the undertaking are presented to them by the engineer. It must be remembered that no matter what their decision is, as individuals they have to endure the insults and innuendos hurled at them by irate rate-payers.

Mr. Yodaiken states that an engineer has no easily accessible advice which he can obtain. I am sure that if he turned back the pages of the proceedings of this Association he would find much valuable advice. Further he can bring his problems to the Forum. I judge from the President's remarks it is very difficult to get the small towns to take any part in the deliberation, in fact it is probably easier to draw the proverbial tooth.

The Administrator of the Cape has, by instruction, resolved the problem of the Cape Municipalities whether tariff should be on a valuation or a room basis. His circular has intimated, *inter alia*, that only tariffs on a room basis will be considered for promulgation. The plea for equitable tariff rates levied by the Railways for goods carried to the remoter area can also with justification be made in the Union as in Rhodesia.

I would, Gentlemen, on your behalf like to second the vote of thanks to be accorded to Mr. Yodaiken for his contribution to these proceedings. I trust that discussions will bring home the difficulties confronting the small town engineer and give him the incentive to join in these discussions to his advantage. Thank you. (Applause.)

THE PRESIDENT: Thank you, Mr. Mathews, I now put the proposal that Mr. Yodaiken be thanked for his paper. All those in favour show in the usual way. (Applause.)

Now with your permission I am going to hold over discussion on both papers till Thursday morning. There are quite a lot of things we want to get through. I want to get through the reports, and I have been

asked if the Quizmaster could in fact reopen the discussion on 11 kV. cables. So I will ask those who wish to speak on the various reports to keep their remarks short and to the point. We have already had the report on the Electrical Wiremen's Registration Board, but I understand there are at least two people who wish to say something about that, so I will throw that open for discussion.

Mr. LOMBARD (Germiston): Mr. President, Gentlemen, in terms of the Electrical Contractors' and Wiremen's Act a person must reach the age of 20 before he can be issued with a Wireman's certificate. In our area there are several bright lads who have passed both their practical and theoretical examination, or who have received exemption from the written examination, and I would like to know what we are to do in cases like that. Quite frankly we have allowed them to do wiring work without supervision, but I think we would like to have a lead from either Mr. Kane or Mr. Smit on that. Thank you.

Mr. KANE (Johannesburg): Mr. Lombard doesn't say what age these youngsters are.

Mr. LOMBARD (Germiston): Under 20.

Mr. KANE (Johannesburg): How far below 20?

Mr. LOMBARD (Germiston): 19.

Mr. KANE (Johannesburg): 19—I think the position is quite simple, if the youngsters have passed the examination and are out of their apprenticeship, then they are entitled to a provisional certificate which can be issued for a period of one year. I think that covers the point doesn't it? If the youngster is not out of his apprenticeship, he continues to work as an apprentice and there is no difficulty at all. There is a complication, of course, in this new Act. It permits a youngster at the end of his penultimate year to take that examination and promptly become a fully qualified artisan. There are some cases where youngsters are under 19, but they can still get a provisional certificate. In the meantime it is hoped that the Act will be altered; that will give us the right to issue the certificate at 20 or on passing that examination in terms of the Apprenticeship Act.

THE PRESIDENT: Thank you, Mr. Kane. Any further questions on that report. Thank you. I think there is quite a short one which I think we can take now since we have got Mr. Hugo up here, and that is the report on the Coal Allocation Committee.

COAL SUPPLIES

Mr. President and Gentlemen,

There is not much to be reported on the matter of Coal Supplies to Municipal Power Stations since May last year. It is now well known that the coal requirements of Power Stations, The South African Railways, Industries and Commerce are in the hands of the South African Coal Allocation Committee. This body acts in a co-ordinating capacity between the various interests concerned so as to ensure that any disabilities in the matter of Coal Supplies are given proper attention.

Your Association is represented on the Coal Allocation Committee which has met regularly every month since it was appointed by the Minister of Transport in March, 1952.

During the past year power stations were satisfactorily catered for in regard to the quantities required to meet consumption and also in providing for the building up of some reserve stocks.

The transport of increasing quantities of coal to consumers at places far removed from coal mines in the Witbank area is being made possible by the diversion of transport by rail, to road transport between the coal mines and points of delivery in the Witwatersrand area. By this means railway trucks are released from short hauls to enable coal to be transported to distant centres of consumption. The cost of transport by road is being met through the special levy of 10 pence per ton which has been put on to the price of coal.

During the year the pit head prices of Transvaal coal were increased as follows:

PEAS:		per ton
Up to 12 evap. units	from 8/10	to 10/2
Over 12 " "	from 9/4	to 10/11
DUFF:		per ton
Up to 12 evap. units	from 5/8	to 8/4
Over 12 " "	from 5/8	to 8/10

When railage is taken into account, municipal power stations at coastal towns, where both Transvaal and Natal coals are being used are now paying from 42/- to 47/- per ton as compared with about 21/- per ton to municipal power stations situated in the Witwatersrand area of the Transvaal.

Although power station requirements have been satisfactorily catered for during the past year in regard to *quantities*, considerable assistance towards that end has been due to the co-operation which has been forthcoming from some undertakings in their efforts to burn coal containing a far larger percentage of "fines", or duff, than that for which boilers were designed. This has, of course, resulted in some reduction in combustion efficiency and boiler availability. The burning of coals containing a large percentage of "fines" (where this could be done) has also enabled those power stations having old boilers which could not otherwise burn poorly graded coal without too great a reduction in output, to be supplied with the coal they needed, e.g. peas. Power station operators must now become reconciled to the fact that for the future they will have to think in terms of having to burn "mixed smalls" in greater quantities than hitherto.

With a Coal Allocation Committee in control under the very able Chairmanship of Mr. W. J. Lamb, municipal power stations can be assured of their interests being catered for to the best that can be done under the prevailing circumstances.

THE PRESIDENT: Thank you, Mr. Hugo, I think we are indebted to our representatives on this Coal Allocation Committee for what seems a very satisfactory situation, certainly as compared with what it was a couple of years ago. Are there any comments on that at all. Thank you. I will now ask Mr. Van der Walt if he has got anything to say on the Tariff Survey Committee.

Mr. VAN DER WALT (Krugersdorp): Mr. President, you will remember when this sub-committee was established at Johannesburg and discussions were invited on a paper by Mr. Pnick, from Johannesburg, he suggested you establish a Tariff Survey Sub-Committee. I then said I

thought it was a very good idea, subject to one condition, and that was that that sub-committee reports within 20 years. Three years have passed Mr. President so we still have seventeen left. Unfortunately due to certain staff difficulties and the magnitude of the task, we are not in a position to report progress. We have received all your tariffs, they have been scheduled, we have classified them and we now intend analysing the tariffs of three local undertakings from which a thousand consumers at random have been taken and we hope at the next convention to report progress.

THE PRESIDENT: Thank you, Mr. Van der Walt. There is obviously no comment on that. That is if we are still here when it is finished. I will ask Mr. Van der Walt to carry on with the report of the Recommendations Committee for New Technical Commodities and the report on the Work of Technical Committees of the South African Bureau of Standards.

RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL PRODUCTS

Mr. President, Gentlemen,

Two meetings of the Recommendations Committee were held during the year. The following matters were considered:

1. *Stranded Aluminium for Earth Wire*

The Committee did not see its way clear to recommend that stranded aluminium was suitable for use as earth wire.

2. *Archer Forced Draft Space Heaters*

As this article carried the S.A.B.S. mark, recommendation was automatic.

3. *Lesco Switches*

The Committee considered these switches suitable for use as Class A main switches and Class B sub-switches.

4. *"E.L." Plastic Wiring Cleats*

After careful consideration, the Committee did not see its way clear to recommend these plastic cleats as suitable for use.

5. *P.V.C. Insulated and Sheathed Multicores Armoured Cable*

The Committee was unable to recommend as suitable for underground use, any P.V.C. Insulated and Sheathed Multicores Armoured cable, until such time as a S.A.B.S. specification has been issued.

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6. Octopus Wiring System

The Committee re-affirmed its previous finding that it considers the Octopus Wiring System as suitable for use.

The following items are still under consideration:—

- (a) Otis Specification Cables.
- (b) Crystal Valve Domestic Pattern Lightning Arrestors.
- (c) Kraus and Naimer Flush Mounting Rotary Switches.
- (d) Copex Plastic Served Flexible Conduit.
- (e) Lucifer Electric Incinerator.

J. L. VAN DER WALT,
Krugersdorp.

THE PRESIDENT: Thank you, Mr. Van der Walt. Is there any discussion on that report? I will ask Mr. Van der Walt to carry on with the S.A.B.S. and Tariff Survey Sub-Committee Reports.

REPORT ON WORK OF TECHNICAL COMMITTEES OF THE SOUTH AFRICAN BUREAU OF STANDARDS

Mr. President, Gentlemen,

The following is a brief summary of the activities of various technical drafting committees of the Bureau of Standards on which your Association has been represented.

A.—QUALITY SPECIFICATIONS

1. *Low Voltage Porcelain Insulators*—No. 161/1955, has now been published and should be a very useful guide to members. Standardisation of insulators has been aimed at.

2. *Electric Cooking Plates* — No. 154/1955, has been revised and is now published.

3. *Paper Insulated Cables for Heavy Duty*—No. 98/1950, has also been revised and published.

4. *Paper Insulated Cables for General Purposes*—No. 97/1950, is now under revision. This revision should take care of the mysterious failures which have been worrying members lately.

5. *P.V.C. Insulated Electrical Conductors*—No. 150/1950, which has been under revision is nearing the completion stage. The final meeting will be held shortly. This is also a specification that is looked forward to, as members have been inundated with P.V.C. cables of doubtful quality.

6. *Vulcanised Rubber Insulated Cables*—No. 168/ , is now being revised.

7. *Oven Thermostats*, has been completed and should be published in due course.

8. *Immersion Heaters for Electric Storage Water Heaters*, has been printed and should be available soon.

9. *Memorandum on Georgi or m.k.s. System of Units*, has been completed and should be published soon.

10. *Electric Stoves and Hot Plates*—No. 153/1950, is being revised.

11. *Wall Outlet Boxes and Cover Plates* is in the final stages of being completed. The final meeting is to be held soon.

B.—CODES OF PRACTICE

A new code of practice, for lighting of streets and high ways is in the course of preparation. This specification is sponsored by the South African National Committee on Illumination. It was felt by this Committee, that South Africa needs its own specification, due to its own peculiar local conditions. This specification when completed, should be of great value to members.

The Meter Test Code

The meter test code which the Minister refused to promulgate has now been shelved as far as promulgation is concerned, but it is still a very useful handbook and code to those undertakings doing meter testing.

C.—SAFETY SPECIFICATIONS

No further progress to the stage reached at the previous Convention can be reported. Although the Minister has agreed in principle, to promulgate the ten safety specifications, so as to prohibit the sale of any article not conforming to such specifications, such promulgation has to date not been effected.

GENERAL

The specifications mentioned in the 1955 report, in their various stages, are still in

progress. Your Association has again been represented, and thanks are due to all willing members who sacrifice time to attend the drafting Committee meetings.

To the Bureau again, we must say thank you for your valuable work done in our interest. May they carry on even after the far reaching changes now contemplated in administration, takes place.

Thank you Mr. President, Gentlemen,
J. L. VAN DER WALT,
Krugersdorp.

REPORT OF TARIFF SURVEY SUB-COMMITTEE

Mr. President, Gentlemen,

It will be remembered that when the Tariff Survey Sub-Committee was appointed during the Convention held at Johannesburg in 1953, I made a remark that it should be a condition that this Committee report within 20 years. We therefore have 17 years to go sir.

In more serious mood, Mr. President, due to the magnitude of this task and shortage of staff, the sub-committee is unable to report progress.

It is trusted that progress will be reported at the next Convention. The sub-committee now wishes to analyse the 1,000 consumers taken at random from each of three undertakings, with different tariff scales, and then draw its conclusions from this sample survey.

J. L. VAN DER WALT,
Krugersdorp.

THE PRESIDENT: Thank you, Mr. Van der Walt. Any comments? In that case we will pass to the Safety Precautions Committee. Mr. Fraser, sorry we have kept you waiting so long.

REPORT OF THE SAFETY PRECAUTIONS COMMITTEE

Mr. President, Gentlemen, as a great deal has been said at these Conventions about Safety, may I commence my report by giving you my report about this Safety Precautions Committee and how it acts. There are ten organisations in this committee represented by 15 members. We have an amendment sub-committee which goes into all queries and gives the main

committee a full report before the main committee gives a decision. Meetings were held in June, March and April of this year and as members will probably remember, at the last convention we were unfortunate enough to lose the Chairman, Mr. Vivian Perrow, which we have regretted. At the first meeting after his death I was appointed Chairman of the Committee. The membership was increased during the year by a representative from a South African Association of Consulting Engineers. The following items were dealt with:

I may say Gentlemen, that there are four members of the committee present at this Convention and I am only the Chairman and I have no doubt that they are tabbing me very, very carefully.

Proximity of Electric Socket Outlets to Water Taps.

As you know, Gentlemen, this has been on our slate for many years, and again we have had representations from the Institute of Architects to amend the rule where a electric plug should be placed not less than 6ft. from a water tap. The Committee is unwilling to amend this precautionary measure at the present time because, without going into the matter, one knows the difficulties that are incurred.

Your Committee examined the 13th edition of the Institute of Electrical Engineers, London, Regulations and comparison with the latest edition of the South African Regulations and noted one or two alterations which will be incorporated in the South African Regulations when they are amended. I would like to say, at this stage, Gentlemen, the committee seek the co-operation of all municipal electrical engineers, and if they have any suggestions in the way of amendments, if they send them to the Committee they will be analysed and placed on a rota which will eventually be incorporated in the amendments to the regulations when they are amended again.

Earthing and Concentric Wiring.

We have had requests whether this wiring is suitable and the committee are still considering it.

Wiring Regulations.

As you know, since our last meeting the Blue Book 2nd edition has been amended

and by the 22nd April, 1956, approximately three thousand English and 400 Afrikaans copies have been sold. Of the 1955 second edition copies are available from the South African Institute of Electrical Engineers, Johannesburg, at 6/6d. per copy, and with postage 6/9d. I would recommend to all municipal electrical engineers that they try to get their electrical contractors to work to the second edition as amended. We have had requests from various people where we found out that they are still working to the first edition and I would recommend for their consideration that they bring themselves up-to-date and work to the second edition.

Protection and Earthing.

A great deal of time has been given by our Committee to the Protection of installations, particularly in regard to the earth leakage, and, as I pointed out yesterday, the committee, intends to seek the advice of all members of the A.M.E.U. who have had any experience in earth leakage protection because our committee finds that, particularly on the Reef, the earth leakage protection equipment that is available today has a lot of short-comings.

Minimum Size of Aerial Conductors.

Your Committee has had a request to reduce the minimum size permitted in Regulation 309 6, that is .012 square inch. It was considered that there was justification for this request and it was decided to ask members of the A.M.E.U. to give details in regard to minimum size or standard size used for overhead service connections throughout the country. I would appeal to members to take the trouble to write to the Secretary and give us their experience, and their own practice, in regard to size of these aerial conductors and the load that they are expected to carry. This will give the Committee a very good reason for altering it, or leaving the regulation as it is.

Miniature Circuit Breakers.

A constant proposal that miniature circuit breakers be used to the exclusion of fuses has been refused. As you know some of our people are anxious that we should embody this in our regulations, but at the present moment your Committee does not consider

this advisable. That is all I have to report. Thank you Gentlemen (Applause.)

J. C. FRASER,

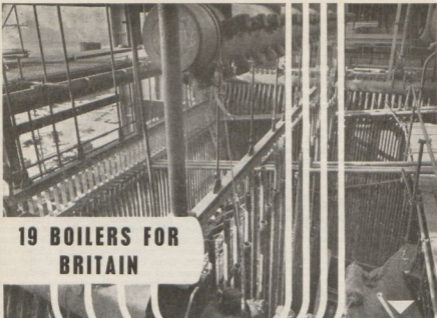
Johannesburg.

THE PRESIDENT: Thank you Mr. Fraser, are there any questions on that? Thank you.

Mr. SMIT (Pretoria): Mr. President, Gentlemen, Mr. Fraser mentioned that the Blue Book had been translated into Afrikaans. It had been pointed out to the Electrical Wiremen's Registration Board that a lot of new technical Afrikaans terms have come into being, and they have not been used in the new translation. This has put us in a bit of a spot because the Translation Bureau, which translated the papers from English into Afrikaans, insists on giving their terms which are not the same as those used in the Blue Book. I have, however, managed to reach a compromise with them by which they will use their terms and put the terms used in the Blue Book in brackets after them.

THE PRESIDENT: Thank you Mr. Smit, that is very useful information.

Mr. SIMPSON (Durban): I would like to bring this little point up. I think it can be taken up by the Safety Precautions Committee. In Durban we supply electricity into the oil sites down in the Harbour. Now that is a government area, but the sites are leased to Oil Companies, and we supply individually to these Oil Companies. For safety precautions, following on troubles and fires, the South African Railways have produced special regulations to be used in the wiring of premises in dangerous situations, and that is near inflammable liquids. We have got a position there that you have wiring carried out by contractors to the Standard wiring regulations, then, in addition, you have an overall further standard that is required to bring it up to what is considered safe in that particular position. I thought I would bring this particular matter up because other than in oil refineries or oil sites down in the Harbour situations, we do have oil depots situated sometimes in the centre of the City, and it may be an advantage to have either an addendum to the Standard Wiring Regulations that



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will give some advice, or more or less a Code of Practice to be adopted in wiring in situations of this kind. It could be, as I say, an addendum to the wiring regulations, or may be a Code of Practice released by the Bureau of Standards might meet the case, but I think it would be very useful and a very sound guide to engineers who meet up with a similar situation.

THE PRESIDENT: Thank you, Mr. Simpson. Mr. Fraser any reply to that?

Mr. FRASER (Johannesburg): Mr. President, Gentlemen, in regard to the Chairman of the Wiring Board's remarks, I was sitting next to the President of the Institute of Electrical Engineers and both he and I would like, if he would be good enough, to give us a copy of the amendments which he suggested in the Afrikaans version, because we can assure him that the Institute of Electrical Engineers gave the translation to which we thought was the highest authority in the land.

In regard to Durban's requirements I would be grateful if Mr. Simpson would send to the Safety Precautions Committee a draft of what he considers will be necessary, and if possible a copy of some other regulations which have been used in other parts of the world. Thank you, Mr. President.

THE PRESIDENT: Thank you, Mr. Fraser. Any more comments on the Safety Precautions Committee's report?

Mr. RITCHIE (Bureau of Standards): Mr. President and Gentlemen, a point arising from Mr. Simpson's remark is that the Bureau of Standards has now completed specifications for apparatus known as intrinsically safe. This is a new type of apparatus; it is half way between the ordinary motors and switchgear and the fully protected flame-proof equipment. We have almost

completed the specifications and a marked system will also be available. The use of this apparatus is recommended in areas such as described by Mr. Simpson and in factories where inflammable solvents, etc., are used.

THE PRESIDENT: Thank you, Mr. Ritchie. That might help both Mr. Simpson and Mr. Fraser as they go along with their recommendations. Any further comments?

Thank you, in that case I think we have just time for Mr. Lombard's report on Code of Practice for Substations.

S.A.I.E.E. COMMITTEE: CODE OF PRACTICE FOR SUB STATIONS

As your representative on this Committee which is really an Exploratory Committee established for the purpose of ascertaining whether a Code of Practice for Electrical Substations on similar lines to the Institute's Standard Wiring Regulations for the Wiring of Premises and the Code of Practice for Overhead Lines will be welcomed, I have to report that this Committee met on one occasion during the year under review. At this meeting a sub-committee was appointed to explore the scope of a possible Safety Code relating to substations but as this sub-committee has not yet reported back to the main committee, there have been no further developments in connection with this matter.

C. LOMBARD,
Germiston.

THE PRESIDENT: Thank you, Mr. Lombard. We have no time for the last report which is on Technical Staff and Manpower by Mr. Van der Walt, which we will take tomorrow. Tomorrow morning I think we can have further discussion on the two papers and also discussion on the 11 kV. cable problems.

FOURTH DAY

Thursday, 9.30 a.m.

THE PRESIDENT: Good morning, Gentlemen, I hope you are well rested, having had an early night for a change. First of all I will call upon Mr. Van der Walt to read his report on Technical Staff and Manpower.

REPORT ON TECHNICAL STAFF AND MAN POWER

Mr. President, Ladies and Gentlemen,

At the convention held at Pretoria during May, 1955, a Sub-Committee to investigate the position as regards Technical Staff and Man-Power in Municipal Electricity Undertakings, was appointed.

Mr. Aspinall, head of the Mechanical and Electrical Engineering Branch of the Witwatersrand Technical College, was subsequently co-opted and has rendered valuable assistance.

The sub-committee circularised a questionnaire to its 109 member undertakings. Fifty replies were returned. I wonder whether the Committee may take it for granted that the 59 undertakings who did not reply, have no staff or man power problems. It is rather a pity that the percentage replies were not more.

An analysis of the replies received is quite interesting. The main points being:—

No. of Artisans employed	967
No. of Artisan shortage	87
Percentage Shortage	8.9%
No. Apprentices employed	263
No. of Apprentices shortage	23
Percentage shortage	8.8%
Ratio Apprentices per Journeyman	1:4.2

Reasons for Artisan Shortage:—

(a) Demand exceeding supply	4
(b) Industrial and mining expansion	7
(c) Remuneration	22
(d) Overtime "given away" by other concerns	2
(e) Housing	6
(f) Working conditions, i.e., long hours, etc.	3

(g) Status—compared with clerical and other positions	1
(h) Output per man too low	4
(i) Public criticism	1
(j) Red tape to employ men	1
(k) Men only allowed on permanent staff if not on capital work	1
(l) Small towns lack amenities	4
(m) Not sufficient apprentices entering trade	5

Reasons for Shortage of Apprentices:—

(a) Salaries	24
(b) Preference to clerical and collar and tie jobs (i.e. working conditions)	10
(c) Lack of guidance	1
(d) Too many loafers	1
(e) Lack of training facilities	1
(f) Housing—when away from home	2

How can Shortage be Overcome:—

(a) Publicity, propaganda and advertising at schools	10
(b) Increase in salaries to attract	12
(c) Immigration	7
(d) Shorter training periods	2
(e) Use of more semi-skilled men	1
(f) Increase of ratio artisans per apprentices	3
(g) Standard salaries commerce and local authorities	3

Should Apprenticeship Conditions be Reviewed:—

Yes	26
No	8

Views on Schooling:—

(a) Min. qualification before completing apprenticeship	9
(b) Incentive for technical qualifications	8
(c) Attending school should be voluntary	5
(d) Correspondence courses compulsory for all	2
(e) Correspondence courses for small centres not effective	3
(f) Documents should be endorsed	1

No. of Undertakings Employing Pupil Engineers and/or Technical Trainees :—

No. of Undertakings	—	—	—	—	—	7
No. employed	—	—	—	—	—	+ 13
No. of undertakings recommending employment by larger undertakings 18						

Analysing the above, your sub-committee wishes to report as follows, and make certain recommendations :—

ARTISAN STAFF SHORTAGE :

The survey does not indicate a shortage which may be termed a national problem. Yet some local authorities show a large percentage shortage, and if not arrested immediately, a very serious position will be experienced in the near future.

Recommendations :

- The career of the artisan should be made more attractive.
- The status of the artisan should be up lifted and should be comparable with that of clerical positions.
- Recognition in salary should be given for technical qualifications.
- There should be classification and grading of the work into :—
 - Operators.
 - Artisans.
 - Technicians.

APPRENTICES :

A—Shortage.

There is no complaint of a serious shortage of apprentices, but there is a complaint of the type of lad offering his services as an apprentice. To overcome this the following recommendations are made :

- The ratio of apprentices to journeyman should be increased to at least 1:2 if a future serious shortage is to be prevented.
- An all round increase in initial wages to make the trade attractive and comparable with junior clerical and commercial positions.
- Raising the status of the trade by more guidance and publicity at an earlier age at school.

B—Education.

- Classification of trades into major and minor trades. (e.g., major trades=Elec-

tricians, fitters, turners, carpenters, etc.; minor trades=Brick laying, riggers, etc.)

- Minor trades to attend classes for two years compulsory, but no qualifying technical examination should be insisted upon.

A qualifying trade test should, however, apply.

- Major trades should attend school for five years compulsory and a qualifying trade test as well as a qualifying technical examination should be compulsory to attain journeyman status. A higher initial education standard should be laid down, e.g., Std. VIII. The possession of a Std. VI. certificate today is of little significance.

4. For country districts, it is recommended that the lads be provided with a supervised correspondence course, as is practised on the Reef and else-where today. If interested persons could say once a week, just supervise the studying of these correspondence courses, it would greatly improve matters.

- For the few more promising and student type of apprentices, the future technician and/or pupil engineer, the sandwich courses as practised overseas is strongly recommended. This means six months at college and six months at work for a period of say two or three years.

6. A bonus scheme for technical qualifications obtained.

- It should be obligatory to employers to ensure satisfactory attendance at school.

C—Technical Trainees and/or Pupil Engineers.

Although the general feeling is that the larger centres should undertake the training of this class of employee, opinions on method of training, period of training and salaries differ widely. Your sub-committee feels that this aspect should be investigated more fully.

As for the Power Station technician, it is felt that this is so specialised, that the larger centres who generate electricity should investigate this aspect and ensure a constant supply for future demands.

These remarks Mr. President, indicate the general opinion of not only your sub-committee, but also members in general who replied to the questionnaire.

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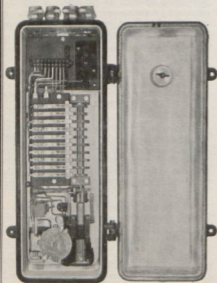
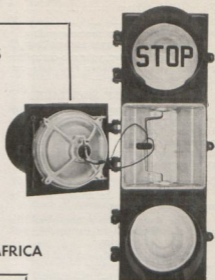
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If members feel that something positive should be done, such as a resolution recommending to the Minister of Education re qualifying technical examinations or a recommendation to the Minister of Labour that apprenticeship conditions be reviewed, then your sub-committee would like to hear those views.

The danger of raising the initial educational standard and thus aggravate the shortage is fully realised, but in spite of this, your sub-committee recommends it. It is so necessary to raise status, and attract the better type of lad. By raising the initial salary, this anticipated draw back will probably be offset.

THE PRESIDENT: Thank you Mr. Van der Walt. For a preliminary report I think that is quite amazing, and I think both the convenor and his sub-committee should be congratulated on doing so much work since we first started this committee. I am going to ask if there are any comments on it although, of course, there are no copies at this stage. It will be printed in the proceedings and then possibly if any Delegate has any points to put forward they can send them to the Sub-committee or at any rate have them ready for the next Convention. The report is now open for comment.

Mr. STEVENS (Ladysmith): Mr. President, I was wondering whether we could have an expression of opinion from some present, on the suggestion for a voluntary system for the interchange of apprentices whereby they can apply for transfer to the Coast or big towns throughout the Union and Rhodesias or even overseas. This would provide those up-country with an opportunity of attending technical schools during part of their apprenticeship at least and of gaining a more varied training. It would further their general education and broaden their outlook. I would just mention that Mr. Kinsman, some may recall 5, 6 or 7 years ago, made a similar suggestion. Thank you.

THE PRESIDENT: Thank you Mr. Stevens. Would Mr. Van der Walt care to reply to that?

Mr. VAN DER WALT (Krugersdorp): Mr. President, Ladies and Gentlemen, that question has been considered, there has also been a suggestion which needs further investigation that hostels should be established at these larger centres, and if say a smaller undertaking or a small concern takes on an apprentice, he probably remains with them for the first year (there is nothing settled, it is just a view) then he is sent to this hostel for intensive training and education and taken for say a period of say two years, and then he goes back to his employer if he has not found employment to complete his apprenticeship anywhere else. That is another question, and interchangeability should also be investigated. I think there is a lot in that.

Mr. President, if the body so feels, this report could be stencilled and forwarded to them before the proceedings come out, if they so wish, otherwise if they get the proceedings, I would like an indication of what they would like.

THE PRESIDENT: Thank you Mr. Van der Walt. I don't think we actually need to go to that length because we are hoping to get the proceedings out very soon this year. As you possibly know the Printers of the papers are also the Printers of the proceedings so that the actual papers are ready to go into the proceedings and the other will be taken off the tape recorder pretty quickly.

Mr. DE LANGE (East London): Mr. President, I think the matter of apprentices is something that affects not only Municipal but any other organisation or trade engineering system in the country or in the Union of South Africa for instance. The question of educational standard, Mr. President, has been worrying.

Now as one who has had the privilege of serving on one of those election apprentice committees, it is very interesting sometimes, Mr. President, to see the reaction of the boy who has most probably attained his 18th or matriculation standard in comparison with the boy who has passed Standard 6. We know there is a shortage of manpower, and I am inclined to feel, Mr. President, at this stage it is going to be dangerous to press for a higher educational standard. I am not trying to say that

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you must just at random take all boys who have passed Standard 6. We have had the experience, Mr. President, where you find a young lad unfortunately through force of circumstance, who had not been able to go any further than his 6th standard at his day school. We find that such a boy sometimes, on the practical side of work, has turned out to be a very good artisan.

On the other side you find that the lad who has matriculated, theoretically he may be good, but practically, Mr. President, he has turned out to be a hopeless artisan. May I say this, Mr. President, sometimes we harp on education, something that we feel is very necessary. We imported, some years ago naturally, some of the artisans from overseas in the ship-building line. Now there I know, Mr. President, that some of these people only passed their 1st and 2nd standards most probably, but who turned out to be some of the finest and most brilliant tradesmen the country ever had. I know that we have quite a few of old stock in East London and whilst appreciating the work of the sub-committee in this, Mr. President, I think at this stage we should be given a wider selection and not automatically turn a boy down if he has passed his 6th standard. I think that he should be given a chance.

Most probably in years to come, Mr. President, with any developing country we know that we must be very careful, and, I think, Mr. President, that when the engineers select the apprentices, they should have the authority, and should be able to go along and have the help of some organisation who can assist. May I say that the South African Railways have a system of testing these lads, and there, Mr. President, that is where I actually had the experience of seeing the difference between these different types of lads, character, background, and everything. Therefore, Mr. President, may I once again say that, although we must where possible insist that a boy should have a high education, we should not just turn him down because he has not passed his exam.

THE PRESIDENT: Thank you, Councillor de Lange.

My own experience is that some of the best tradesmen are those who did not want

to go to night school at all, but you have got to decide what you are going to do with the boy. Often I have found as I say, that the boy who doesn't want to go to night school, doesn't want to go to technical college of any sort whatsoever (and you spend your life trying to get him to go there), shouldn't really go there at all, but he makes a very good artisan. So I think it is a question of splitting into two parts those that we feel can make use of some further technical or higher technical education, and those that never will, but will make good artisans.

We, of course, have certain trouble in this country which must be watched, and that is that often enough a Native will make a very good artisan. If the white man is only going to be as good an artisan as the Native without any technical training, without any higher technical education, than the Native, he may be in trouble in some time in the future. But I don't want to go into politics, but I just want to point out that there are a lot of problems in this, and they just can't be solved at once.

Are there any further comments.

In that case Gentlemen I want to give the precedence to Mr. Yodaiken, and I am going to open Mr. Yodaiken's paper for further discussion. Thank you.

Mr. MILTON (Johannesburg): Mr. President, I have got rather a formidable document here which is the discussion on Mr. Yodaiken's paper which I have prepared with a view for submitting for publication, not for presenting in detail. I do feel that Mr. Yodaiken has introduced a subject which is of very great interest to the smaller municipalities who form the majority of membership to this Association, and I think he is to be congratulated on very frankly airing a number of his difficulties and those which are also faced by other small municipalities.

One of course is astounded at the rate of growth of the system to which he has referred on occasions in his paper, and if only the rest of us dealing with these smaller cases could produce the same rate of development, I think we would be in very serious trouble.

Whilst Mr. Yodaiken has rather indicated that the position of those of us who operate

our own generating plants is perhaps to be envied by those who purchase in bulk, when dealing with the capital expenditure side I rather think the reverse is true, and, in point of fact, he has himself proved the contrary. If his own system had been faced with providing for generating plant equipment to match the rate of growth of load on his distribution system, and the extensions of that distribution system, I think he would not have pleaded to be included himself among the people requiring smaller amounts of money to be doled out after the lions had had their share, but he would probably have been one of the lions.

There was another point I find it rather difficult to deal with at this stage, Mr. President. I know time is short. There was one other point which was mentioned in Mr. Yodiaken's paper and that was on the unit price basis. I hope I am not confusing the two papers. But there I think one has got to be a little careful on unit price, and this also applies to the paper from Salisbury. In line with what our friend Mr. Sibson has already said, I fancy that we should not make available electricity which encourages waste. Wasteful development is no good to any of us because a time will inevitably come when a fair charge must be raised for the services rendered, and then you will have encouraged a populace in the installation of appliances which are no longer economical to the people who have bought them. Then I think you become guilty almost of mal-practice by getting a development under false pretences. At the same time the gift or free gift of electricity is very dangerous because that is an aspect which encourages waste. It is far better that people pay for a service, because the things we pay for are really the things we appreciate in this life, at least that has been my experience. Usually the people to whom you make a free gift are usually the people who appreciate that aspect of living rather more than the wealthy people.

Mr. President, in conclusion I would like to say how much I have appreciated Mr. Yodiaken's paper and to advise you that I will hand in a copy of this to the Printers in Germiston. (Applause.)

CONTRIBUTION TO DISCUSSION ON Mr. J. YODAIKEN'S PAPER ON "SOME ASPECTS OF THE WORK AND DIFFI- CULTIES CONFRONTING THE SMALL COMMUNITY ELECTRICAL ENGINEER."

Submitted by Mr. W. H. MILTON
(Johannesburg).

Mr. President, Gentlemen,

I feel that Mr. Yodaiken deserves a very considerable amount of praise for his fearless exposition of the difficulties which face the Electrical Engineer in charge of a relatively small Municipal Undertaking.

As I have had long experience of dealing with Engineers who fall in this category and also with their Councils from time to time, I can say with sincerity that I am in a position to appreciate many of the points which he has raised in his paper.

To deal with last things first, it is noteworthy that the Author, probably in desperation, has come forward with suggestions, which may almost be construed as demands, for preferential treatment of these small electricity schemes, in order that they may compete with their larger brethren.

One aspect of this paper which has caused me to marvel is the graph set out as Figure 1. I am tempted to suggest that one or other of the scales used is incorrect.

In the context of his paper the Author draws attention to the graph, quoting figures in the context which purport to be represented on that graph. He states that commencing with 200,000 units in 1946 the annual unit consumption increased to 5.5 million units in 1956. Reference to the graph indicated the possibility of the 200,000 being indicated midway between the lines marked "1946" and "1947" whereas the 5.5 million units is indicated midway between the years marked "1955" and "1956". Whilst the plotting of points in the mid-period to represent the total quantity in respect of a year may be justified on the basis of the particular month in which the year ends, I do not see why the 1946 figure should appear for June of that year while the 1956 figure appears for June of

1955. This may be inaccuracy of reproduction and in point of fact the first figure named by the Author in his context has not been plotted on the graph.

At all events these figures represent a growth at an average rate of 32% per annum over ten years or alternatively 45% per annum if the graphical representation for nine years is correct.

The graphical representation then indicates a forecast from 1955 (queried) up to 1958 (queried) which shows an average rate of development during that period of 60% per annum.

Figures such as these are only possible when there is an extreme expansion of activity in the area concerned or a continual acquisition of industry at a steady rate, the curves not showing very marked points of inflection, and if such forecasts are to be accepted they can only be based on actual applications for supply where consumers are committed to take that supply.

With load development such as that indicated by the Author, I think he has departed very considerably from the average conditions applicable to the small community electrical engineer and the case he has presented must be regarded, in my opinion, as exceptional.

Such growth of load, however, does support as a reasonable condition that the system as a reasonable condition that the £160,000 and gives adequate provision for load increases up to eight or nine times the present load.

Such provision is not economic in more normal cases because too much money is invested in the first instance for utilisation a long time hence.

Normal development is usually of the order of 8% to 10% per annum although these figures are considerably exceeded in many cases under the present conditions affecting the development of electricity supply in the Union and the Federation.

Figures of 16% are not uncommon and figures as high as 20% per annum are measured. In anticipation, I would suggest that these facts are borne out by information which has already been circulated but not yet presented to this Convention.

If we accept the rather high figure of 16% per annum development then the provision of a network with the capacity eight or nine times the present loading thereon, will suffice for periods of fourteen to fifteen years. This in itself is a provision for long period increases in loading and must be a burden on present day users.

Network capacities can quite effectively be increased with the passage of time by the installation of intermediate substations feeding into that network provided of course the network is originally planned with that end in view. The injection of supply into a low voltage network at intermediate points has the effect of quadruplicating the capacity of the low voltage network.

Much of the expenditure on distribution and low voltage reticulation lies in the cost of the low voltage network and the provision of a high voltage distribution system in the first instance capable of being used over a relatively long period of time does not constitute such a burden as the provision of an entire network with that end in view.

It is unfortunate that the Author's reference to the comparative expenditure of £160,000 for eight to nine times the present load with an expenditure of £100,000 for twice the present load should have been used in conjunction with the rate of development indicated as being applicable to this network.

The Author's reference to the condition into which substations are allowed to develop is, unfortunately, not only true for the small communities but also sometimes occurs where quite large communities are served from substations which should have been either abandoned or modified with the progress of development of the Undertaking. Fortunately, this position is to some extent catered for by the Government Inspection which prevails in the Union of South Africa and such "death-traps" are becoming less and less frequent. It must be admitted that, in the absence of an effective Electricity Department, any electricity undertaking is severely handicapped in avoiding the pitfalls of inadequate substation accommodation in the first instance and also in dealing with

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requests for increasing supply which must be accompanied by expansion of the Undertaking. Unless a small Undertaking has at its call the advice of experienced and qualified personnel (possibly in the employ of the Supply Authority) it may be argued that the Undertaking should not be permitted to develop because of the danger of permitting development which may hamper the future prospects of the community served in the first instance.

I feel that the Author's views in respect of the planning of development cannot be too wholeheartedly supported.

When dealing with the larger Undertakings, there is usually a sufficient abundance of technical opinion to ensure that the Controlling Body (if it is a Municipal Council) can be satisfied as to the necessity of planning well ahead.

Where the technical body is smaller and less influential, the laymen comprising the Council in most instances find it difficult to treat the proposals put before them in any other light than that of the ordinary commercial aspects.

In most ordinary commercial business, particularly those dealing with wholesale and retail trade in the everyday commodities associated with feeding and clothing the populace, stocks can be obtained in a relatively short period of time whilst money is available and, where necessary, products can be obtained for import and/or purchase.

This means that the average business man is only called upon to deal with the estimated requirements of his customers covering a relatively short period of time and certainly not the periods of three or four or five years which must be dealt with in connection with electricity supply.

I would submit that, if water supply schemes were dealt with on the same short-term basis that is often applied in connection with electricity supplies that many a community would suffer the pangs of thirst and would cease to develop as communities in general are doing at the present time.

Why a Municipal Council can accept with equanimity the provision of an adequate water supply catering for a growing community for a very long time

ahead whilst on the other hand when dealing with provision for electricity supply will restrict expenditure when making provision for that developing community is difficult to understand.

Unless the planing of an electricity supply system in respect of both generation and distribution is based on long-term requirements, it is inevitable that the expenditure on that network will be increased very appreciably with detriment to the continual development of the electricity undertaking and to the consumer's pockets.

All too often one hears the plea for special consideration to be given to the smaller undertakings to enable them to compete with their larger neighbours, but the people making those pleas are not prepared to provide for the adequate development of those small undertakings in competition with their larger neighbours on an economic basis because they have not the vision of the personnel controlling the larger undertakings.

The problem confronting the qualified personnel of the undertaking is to ensure that the recommendations are most economic when viewed in the light of continually developing loads. When sound recommendations are put forward and are modified by the laymen of the Council, the resultant future debacle is never laid at the door of the party actually responsible, the technical staff more often than not becoming the scapegoats.

The purpose of these remarks is to endeavour to bring home to the Councillors in charge of developing communities the necessity of applying foresight to these problems which involve a much longer period of time to implement than do the requirements of the average ordinary business concern.

The Author, dealing with supply in bulk from the Federation Electricity Supply Commission, draws attention to his difficulties in respect of protection especially discrimination on relaying feeders and also to the problem of interruptions of supply.

In the latter respect, much can be done to reduce interruptions of supply to negligible proportions but this must necessarily entail the expenditure of very considerable

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sums of money by the Supply Authority concerned and fair expenditure must in turn be met, by way of the charges for electricity, by those consumers who benefit from the additional provision for continuity of supply.

In most instances, if the consumer or consumers concerned are informed of the extent to which the charges for electricity must be increased to achieve a reduction in interruptions, those consumers will immediately say that the improvement is not worth the money involved.

One often hears the argument that continuance of local generation is preferable on the grounds of improved continuity of supply, but it is not often that the protagonists of this suggestion are prepared to disclose the money paid out annually in order to achieve that continuity. If the sums of money involved are disclosed, then most of us will protest at the payment we are making for such continuity.

There are parallels to this in all walks of life and most of us adopt the way of living in accordance with what we are prepared to pay for that way of living. I would suggest that where Municipal or private enterprise provides for public transport, considerable improvement in the timetable and certainty of the transport can be achieved but none of us is prepared to face the cost of each journey which would be involved if such additional security were provided and, whilst we complain at breakdowns and defects in operation to timetable, such complaints are merely a natural human reaction. If told what it would cost to remove the cause of those complaints, none of us is prepared to face the increased expenditure. To that extent we are individually responsible for the type of service we receive and should, really, when lodging our complaints, lodge those against ourselves. This is beyond human nature.

In some cases the duration of interruption can be reduced to such an extent that they are not noticeable to the consumer. This is achieved by employing the extremely fast reclosing breakers which are available and which reclose within one cycle. Such fast reclosing, however, may be quite embarrassing to the consumers receiving supply if the equipment he is serving is

incapable of accepting the institution of supply after such a brief interruption.

On the subject of metering and testing, the Author again draws attention to the bugbear of cost. He mentions a sum of say £5,000 which, in turn, should actually be viewed in the light of the previous figure mentioned of £160,000.

This sum then represents a figure of the order of a 3% increase in capital investment involving possibly a 3% increase in the capital charges on the Undertaking. Notwithstanding the fact that the capital charges represent a large proportion of the total cost of the electricity service to consumers, the 3% must then be further reduced in its incidence for the final price to be paid by the consumers.

I would go so far as to say that few tariffs of charges to consumers can be corrected to such very small margins and one may therefore say that an expenditure on capital account of this order will have virtually no effect on the prices charged to the consumers of the Undertaking. On the basis that the cost of such testing equipment in relation to the total cost of operating an electricity Undertaking is virtually negligible, there should be no difficulty in persuading the body responsible for authorising its purchase and installation that it is not only a necessity but a welcome addition to the tools available for the electricity department.

More often than not when metering equipment begins to fail it is found that the meters concerned are under-registering. Whilst this may be of advantage to the particular consumers affected, it is to the detriment of the community as a whole because, what is lost in revenue from a few consumers, must of necessity be paid by the remaining consumers. From the point of view of securing a fair revenue for the service rendered, such an expenditure on testing equipment is a sound investment.

On the same subject the Author states that it is essential that the consumer "should not pay for what he has not received". This is an attitude adopted by most consumers of electricity and to hear it put by the Author in these words, consumers may obtain a wrong impression of their responsibilities.

What most consumers fail to realise is that there is a very definite investment of capital and employment of staff on the assets purchased which is quite independent of the time when or during which the consumer makes use of the service available to him.

Most consumers adopt the fallacious attitude that if they are not actually using units of electricity then they should not be called upon to make any payment whatsoever for the electricity service. Too much stress cannot be laid on this aspect of electricity supply. In point of fact every consumer is renting for his possible use a portion of the entire Electricity Undertaking and the staff and personnel employed by that Undertaking. This service is usually costed by bulk supply authorities on the basis of a monthly service charge and a demand related charge to which is attached the minimum payment. The extra cost to which the supply authority is put in burning more fuel in the boilers and other attendant costs dependent upon the number of units supplied may then be reflected in the charge per unit. This means then that every consumer must expect to make a definite payment whether or not he uses electricity during any portion of the year. As I have already said this is in effect a rental which he pays to ensure that electricity will be available to him whenever he requires it.

In order that these remarks of mine may not be applied too literally in the design of a tariff, I would point out that when a consumer is charged for his actual demand upon the system and not his effective demand on say the generating plant or the bulk supply authority, there is almost invariably a diversity of demand which must be taken into account. This means, for example, that kVA sold to a consumer does not involve a whole kVA purchased from the bulk supply authority or supplied from the generating station although, in certain cases, this may be true in the reverse namely that a kVA of consumer's load means more than a kVA of load on the source of supply.

A problem which is then posed is "to what extent should be diversity of demand be shared between all consumers without regard to the individual consumer's contribution towards that diversity?"

An answer to this question can only be furnished after detailed investigation of all the relevant data but it may be said that the unit rate should be increased above the true "additional cost" by such an amount that a consumer who does not contribute to diversity meets the actual average cost of generation and distribution based on the "demand" on the generating station. This means that such a consumer does not participate completely in the overall average diversity of the entire system.

It is not often desirable that such a consumer should be robbed of all benefits from diversity because his load coupled with that of the remaining consumers is responsible for the aggregate of the generating station capacity which, on the basis of stable prices, may be regarded as reducing with increasing load (of course within certain limitations which must never be lost sight of).

When this system of adjustment is adopted, the actual charge for the maximum demand as raised against the individual consumer is actually less than the rental due from him if no units are used because, in point of fact, every consumer would contribute towards those principal fixed costs by way of his payment for units used. If no units are used then that consumer's payment falls short of the rental due from him. This anomaly is, however, unavoidable unless the minimum charge is raised in excess of the aggregate of the service and minimum demand charges. These are detailed aspects of tariff design which cannot be dealt with fully in this contribution.

Whilst on this subject, however, I would offer for the Author's consideration the fact that the average cost of electricity in the total cost of production by industry is of the order of 2.5%. This cost varies over a relatively wide range but by far the majority of industries operate with a very much lower incidence on their cost structure arising from their payments for electricity used. Those industries in which the cost of electricity represents a relatively high proportion of the total cost of production are usually of the electrolytic or electric arc type. Such industries are almost invariably ones making very great relative use of electricity and the average cost of

electricity in the cost of production for industries generally is raised by no small percentage on this account.

Unless an industry of this type is concerned, I would venture to suggest that the actual relative cost of electricity in several situations will not sway an industry in its choice of locality. Such choice is usually decided principally on the basis of a cost of supplying manufactured products into the market in which that product is to be sold. Probably a secondary consideration lies in the amenities which are associated with the various localities which could be used for the establishment. This is due to the fact that later turnover and actually the employment of required staff may depend to a considerable extent on the amenities available to employees. These amenities are not just those affecting the men but to a great extent those affecting "the wife and children".

In this respect a small town is almost always at a disadvantage when compared with a large town and the cost of electricity cannot, in my opinion, be adjusted to compensate for these differences in attraction on other accounts.

It is always an easy matter to pick on the cost of electricity because this quantity and this Department seems to be the cinderella of our community life. One wonders why publicity is not given to the effect of relative rateable values and relative prices of sites etc., but it is a fact that these aspects are seldom given publicity and these charges are seldom accused of being responsible for the loss of an industrial consumer to a specific community. Why not also question the incidence of railage rates on raw materials or manufactured products in relation to the potential markets and state what the magnitude of these items has resulted in the concentration of an industry in the vicinity of the market? To my mind these are far more important factors which should receive consideration and, if necessary, publicity, if it is considered desirable to press for the wider distribution of industrial development.

Before leaving this aspect of the Author's paper, I feel it would have been much more informative if the costs had been split up to show, for example, the contri-

bution to the total cost shown by the Author in Figure 2 made up by the local capital charges, the cost of purchase of electricity, the cost of management, and the cost of operating and maintaining the Undertaking.

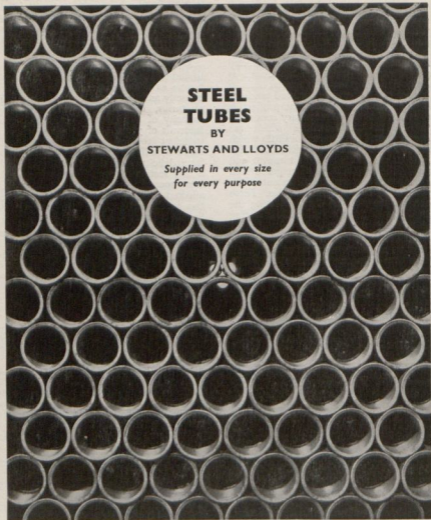
Where a profit is permissible, it is usual to find that relatively substantial profits will accrue as a network reaches its designed capacity and therefore, by judicious design of tariffs, the effect of increasing the capacity of a network at economic time intervals of years, can be minimised. If a sufficient accumulated profit has been built up in a tariff reserve or rates equalisation fund, deficits which may occur immediately a new section of capital works is brought into operation need not necessarily be affected in an increase in tariffs because the funds accumulated can be used to finance such deficits for a time.

Unfortunately it would seem that the funds accumulated in this way often reach apparently large proportions, which may be very necessary if the purpose of the fund is to be effective, such large sums being available may be drawn upon for other services than that of electricity supply. Such diversion of funds is always to be deprecated.

The Author's remarks in Section 9 of his paper are clearly aimed at clarifying the position of an authority purchasing electricity in bulk.

If we examine this same series of comments in the light of a supply authority providing its own generating plant, the Author has in fact very clearly illustrated the beneficial position in which a purchasing authority is placed in relation to a generating authority.

One is compelled to examine the figures which he has mentioned when he states that the potential load of 800 kVA may be necessary to regard extensions (of the distribution system) into these particular areas where the design required provision for a load of 4,000kVA. Whilst he says that these figures are not large in themselves, they become great when related to the total maximum demand of 1,350 kVA (at the time). The provision for this load supply in the area need not have been made more than shall we say twelve months



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in advance having regard to the delivery times for transformers, cables and switch-gear.

If the Author had been responsible for the provision of the necessary generating plant, no doubt the immediate load of an additional 800 kVA would have called for decisions in regard to the extensions of generating plant capacity and in that connection, if a steam plant is involved, the minimum period within which the additional load could be furnished for the supply might well be of the order of three or four years. At the same time if the industrial area was expected to expand to say 4,000 kVA shortly thereafter, additional generating plant would also require to be provided three to four years ahead with that magnitude in mind with due regard to standby generating plant.

In these circumstances to draw attention to the fact that it does not take more than one or two 200 kVA transformers with spares to represent a very high percentage of the total installed capacity, how much more would the costs be effected if generating plant capacity is involved at the same time. From this point of view it is very clear that the authority purchasing supply in bulk has a tremendous advantage over the authority called upon to generate its own requirements.

The general principal that an Undertaking does not carry spares in proportion to its size is only true to a limited degree because much depends upon the number of each size of equipment against which a spare must be carried. By judicious distribution of load centres the percentage of spare plant capacity in distribution systems can be minimised. It is perfectly true that reliability can best be secured by providing a spare. This means that if only one of the article is installed the spare plant capacity required becomes 100% whereas with 100 of such items it may well be found that only 10% of the installed capacity would suffice for spare part purposes. There is no method possible that I can visualize of overcoming this disparity.

The other difficulties in respect of maintenance and installation work to which the Author refers are realistic and constitute just one of those difficulties which must be faced by reason of the size of the particular Undertaking involved.

Coming to the question of By-Laws, the Author's comments are most valuable. In my own experience the Author's difficulties are very real and, by the very nature of things, the Controlling Body which is the Council is very apt to view with disfavour consumer resistance to the application of By-Laws which are drawn up strictly in the interests of all consumers as a whole.

To some extent the difficulties do arise because the technicalities which must of necessity be introduced if the regulations are to have a real meaning in law are not well understood by the layman.

When those technicalities are reduced to non-technical terms, the process of reduction often completely destroys the effective policy of the particular regulation or By-Law and leaves it so full of loopholes that, when expert advice is called as it must be, in a Court, the experts will say at once that they By-Law is meaningless and quite ineffective.

This seems to be one of those anomalies with which the technical services are faced and why it should be permissible for people such as for example the Medical Profession to utilise in their Regulations and Laws and By-Laws complex medical terms but for the engineer to be refused that facility has always been a puzzle to me.

The significance of phraseology must be accepted because quite often the legal interpretation of a phrase differs from the layman's understanding of that same phrase and for that reason the technician must of necessity accept the advice of his Legal Advisers when it comes to the use of particular phrases because only the Legal Advisers can offer sound opinions in respect of the meaning of such phrases in Law. On the other hand our Legal friends should accept from the technician the meaning of technical phrases and the necessity for the use of such technical phrases.

I often feel that the insurance companies can do much to assist us in our difficulties in this connection.

If it is recognised sound practice that in the interests of safety and in the interests of avoiding fire hazards as well as deaths, certain conditions should be imposed upon

persons providing or acquiring an electrical installation and installing machinery, equipment and appliances for the use of electricity, I cannot understand why the insurance companies do not vary their premiums or even refuse to insure premises which do not comply with the minimum requirements for safety in these directions. If insurance premiums are adjusted in accordance with the quality of the installation or even refused where the installations do not comply with recognised standard practices, the people concerned will soon see to it that their installations are improved to the required degree to obtain insurance. At the same time the probable expenses of the insurance companies would be reduced to the benefit of us all.

To quote the example used by the Author it is probably even more amazing that an insurance company will grant insurance on the basis of the £100,000 spent on factory building and will not penalise the owner of that property because he regretted the amount of money spent on installing the wiring, etc., in order to bring the factory to life (presumably in safety).

I am aware of one actual instance where fire insurance was refused until such time as premises were rewired because the old wiring installation constituted such an extreme fire hazard. This consumer immediately proceeded to rewire his installation although he had refused the supply authority when requested to do so by that body.

As regards the conclusions arrived at by the Author, the situation must be viewed in the light of the particular circumstances and his recommendation No. 1 cannot be accepted for general application. A paper which we are to receive in respect of Salisbury seems to me to well illustrate this point. The additional work imposed on the staff of the Salisbury Municipal Electricity Undertaking compared with the utilisation of electricity in the outer area and its probable revenue and expenditure Balance Sheet make one wonder whether such development work would "help the expansion of a town's economy". It is true that, in certain instances, conditions would be helpful but without an intensive extensive knowledge of conditions in the Rhodesias

one cannot offer constructive comment. As regards the Union of South Africa, however, it is safe to say that only in rare instances would the supply in the peri-urban areas adjacent to small towns assist in the electrical economy of the particular town concerned. In most instances it is not unlikely that the development of these supplies may have the reverse effect and in fact become subsidised by the town to which the particular peri-urban areas are adjacent.

If peri-urban areas are fairly well populated, it is not unusual to find that these peri-urban areas are adjacent to large towns where the expansion of supply by the town into those areas is of very little effect on the town's economy in respect of electricity supply. At the Convention of this Association held in Pretoria, the address in respect of Pretoria's activities is very significant on this particular point.

Conclusion No. 2 calls for no comment because the desirability of these features is so very obvious to those responsible for the management and operation of electricity Undertakings.

As regards his third recommendation, it would appear he is discussing matters as they affect the Federation on which I am not well informed.

In conclusion, Mr. President, Gentlemen, I would like to congratulate the Author again and to thank you all for the opportunity I have been afforded in contributing to these discussions. I would stress that the remarks which are contained in this contribution are my personal views and do not necessarily represent the views of Escom which Body I represent at this Convention.

THE PRESIDENT: Thank you Mr. Milton.

Mr. SIBSON (Bulawayo): Mr. President, Gentlemen, I would like to add to the words of congratulation that have already been expressed to Mr. Yodaiken for this extremely valuable paper. It is of particular interest since, as Mr. Milton has said, it concerns the activities of the greater portion of the membership of this Association. I do not wish to take up more than one moment of your time, but I do wish to say this; that practically all the problems to which Mr. Yodaiken refers and which, I

believe to a large extent are common to the smaller undertakings, these problems are the finest argument that I have ever heard for the setting up of Regional Branches of this Association.

I am sure that a tremendous benefit can accrue to the smaller towns if they could get together in areas in such a manner that without very great expense they could meet each other and their fellows perhaps in the larger towns at frequent intervals and discuss their problems. I am quite sure that in Rhodesia, for example, we would all, those of us who are in a position to help others, would all be very glad indeed to set aside the necessary time to meet with our fellows of other parts of the country and discuss their problems even as frequently as once a month. I think I can say we would be prepared to do that and not only for the benefit that they might obtain, but for the benefit that we, ourselves, too could obtain because some of those fellows working away on their own have quite a lot of time to think, perhaps more than some of us have, and no doubt have some pretty good ideas that I think want to be heard to be appreciated. So I do throw out the suggestion, not only to Mr. Yodaiken and his Council, and to other similar places, but to all the members of this Association to make use of the facilities now available for the setting up of Regional Branches so that they can meet each other much more frequently and with far less expense than the annual Convention.

(Applause.)

THE PRESIDENT: Thank you, Mr. Sibson.


Mr. LOMBARD (Germiston): Mr. President, Ladies and Gentlemen, I have prepared several comments on the Author's paper, which I found to be very interesting, and I would like to take this opportunity to congratulate him on his very excellent paper. I do not want to take up too much of your time, however, and I will send in my comments in writing. There is one aspect, however, that I would like to touch on though. I was very interested to hear about the Author's difficulty in regard to protection settings, as engineers of municipal undertakings on the Reef have similar problems. I am referring, of course, to those

undertakings that are supplied in bulk by the E.S.C. Rand Undertaking.

In fact when comparing the protection settings on the bulk supplies of the Author's undertaking with those which normally apply to undertakings on the Reef, it would appear that he is rather better off than engineers on the Reef. He mentions that in his case the bulk supply authority's relays are set for a minimum tripping time of 1.1 seconds of overload, and .84 seconds on earth leakage. On the Reef all bulk supplies are, of course, unearthed and the practice is to provide an overload setting equal to 150% of capacity of the bulk supply transformer or transformers, with the time setting multiplier of .10. It will be appreciated that even with fairly high impedance transformers, say of the order of 7 or 8%, the prospective fault currents may approach 10 times the normal rate of current on the bulk supply transformers, and the tripping time under these conditions would be approximately .38 seconds.

With lower impedance transformers the prospective fault currents would, of course, be higher and the tripping time correspondingly lower. Under these conditions it is impossible to obtain satisfactory discrimination of the system with inverse time overload protection, and many Reef undertakings have therefore installed earthing compensators designed to limit earth fault currents to suitable values so that discrimination can at least be obtained under earth fault conditions.

Mr. President, here I want to make it perfectly clear that I am not trying to criticise the E.S.C. Rand Undertaking. The E.S.C. officials have been most helpful, and I would like to mention that in the case of the near 33 kV. supply for Germiston the minimum tripping time setting originally was .41 of a second, and has been increased to .82. It is still very tight as you can realise, but it shows that the E.S.C. officials are trying to help us wherever possible. I am also not trying to suggest that there is a very easy solution to this problem. But I think as time goes on and municipal undertakings grow this problem is going to become more and more difficult and a solution will have to be found. Thank you, Mr. President. (Applause.)



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THE PRESIDENT: Thank you, Mr. Lombard.

H. T. TURNER (Umtali): Mr. Yodaiken has, in his paper, I consider, put up a prima facie case why a comparatively small electricity undertaking might, in the interests of all concerned, be better owned and operated by a large national undertaking, such as the Electricity Supply Commission until such time as the scheme has grown to a size when its consideration as a separate entity under municipal control becomes an economic one. I am far from being one to advocate nationalisation of the electricity supply industry but I feel sure every one of the difficulties experienced by a relatively small undertaking so graphically described by Mr. Yodaiken in his paper would cease to exist if such an undertaking formed part of and was thereby able to make use of the considerable resources of finance, staff, stores and stand-by equipment, etc., of the national undertaking.

Perhaps the most important function of a municipal electrical engineer is his ability to provide and/or distribute electricity to the greatest number of consumers at the least possible cost having due regard of course to the many facets of economics and engineering principles that are bound up with the provision of such supplies.

It is in the light of what I have just said that I wish to criticize Mr. Yodaiken's paper. To build a scheme to give adequate provision for load increases up to 8 or 9 times the present load seems to me, particularly in a small undertaking, quite unnecessary and economically unsound, unless there is a very definite certainty that these potential load increases are going to occur within a reasonably short space of time. Mr. Yodaiken states that in connecting up an industrial consumer whose load was of the order of 800 kVA the reticulation was designed for a load of 4,000 kVA. This also seems quite unnecessary and I would like to ask Mr. Yodaiken how many years he thinks will elapse before the load on this section will approach 4,000 kVA.

Modern networks can be designed more or less to fit in with available finance and load conditions without rendering the original extensions either inadequate or

obsolete. Furthermore the development of industrial loading is generally unpredictable and the initial stated possible requirements of industrial consumers demands do not always materialise. For example in the boom years just after the war a large number of heavy industrial stands were sold in Umtali and discussions with the owners indicated that their potential electricity requirements would necessitate providing a reticulation to cope with some 6,000 kVA and if a suitable ring main was installed to cope, expenditure of something like £50,000 would have been necessary. We decided to wait and run out from the power station cheaply constructed overhead 11 kV radial feeder to connect up to industrial loads as and when they occurred. It has taken 10 years to reach 3,600 kVA of industrial load and we have only incurred an expenditure to date of £22,000 to provide it.

Under the heading of Metering and Testing Mr. Yodaiken mentions that the cost of testing equipment of various types may not exceed say £5,000. I sincerely hope Mr. Yodaiken does not propose to inflict expenditure of this magnitude on a community of 530 consumers whose maximum load does not exceed 1,500 kVA. In Umtali we have for years managed very well on a couple of portable rotating sub-standard meters for testing kWh meters and 5,000 and 500 volt bridge meggers together with a capacity meter for cable fault testing and a few other necessary bits and pieces, the whole lot costing something of the order of £800. Only now when the undertaking has expanded considerably have we purchased a meter test board and 40 kV D.C. cable break-down set and even then the total expenditure incurred is well under £5,000.

I mention the foregoing to indicate that it is so very necessary to relate all expenditure to the size and rate of growth of the undertaking otherwise the cost of energy can soon rise to a figure which will be detrimental to any further expansion in the future.

Mr. GRIPPER (Port Elizabeth): Mr. President, there is one paragraph in Mr. Yodaiken's paper which struck me forcibly in that I hoped it would call for a few items for discussion from our Councillor

members. This is a type of paper on which a Councillor I am sure could find much meat to discuss. I appreciate that time is short and I just want to make this one point, Mr. President, that there is a paragraph in which Mr. Yodaiken says that in a small town "everybody knows everybody else." Now that can be used for and against an undertaking. And the point which the Author makes is that it is liable to cause deterioration in public relations in that the Council perhaps is less inclined to suit the requirements of his staff, and I would like to press home this point that the staff have a very important public relations duty in developing goodwill with consumers. I, for one, would like to hear the views of Councillors at this Convention or published in the proceedings on the question of developing consumer goodwill, which I am pleased to note seems to be of a very high order in Salisbury. But in some other centres due to the fact that there has been no need to press the sales of electricity it is deteriorating. The time may come when we have the reverse and those undertakings that have maintained their showroom facilities, their consumers engineers' departments are going to score then. Thank you, Mr. President. (Applause.)

THE PRESIDENT: Thank you, Mr. Gripper. Any Councillor like to comment on the paper?

If there are no further comments I will ask Mr. Yodaiken to come forward. It will be realised that he cannot really reply to all the points made, but he obviously will want to thank his proposer and seconder, and possibly give some cursory replies to the comments made. He is, of course, at liberty to contribute in writing to the Proceedings full replies to everything, and he will be given the opportunity of seeing the comments in print before he does that. Mr. Yodaiken.

Mr. YODAIKEN (Que Que): Mr. President, and Gentlemen, I do wish to take this opportunity of thanking you first, my proposer, Mr. Stevens and seconder Mr. Mathews, for the vote of thanks which was given to me after my address.

The questions which were raised by various contributors I would much rather reply to in writing. Mr. Stevens' question

for example regarding testing equipment I do feel requires a little bit of detail and it would not be quite fair to gloss over a reply in a matter of minutes.

Mr. Milton's contribution, of which I have already had a copy certainly requires very considerable thought before reply, and I would rather reply in writing, and I shall do so at the earliest possible moment. Thank you. (Applause.)

REPLY BY Mr. YODAIKEN TO CONTRIBUTIONS AND COMMENTS ON HIS PAPER "SOME DIFFICULTIES CONFRONTING THE SMALL COMMUNITY ENGINEER"

Mr. President and Gentlemen,

In replying to the contributions made by various members I will endeavour to reply to each individual contribution.

Mr. Stevens, during his remarks, requested information on the testing equipment which is available in Que Que, and this is listed as follows:—

- (1) A 1000 Ampere 0-150, 0-300, 0-600 volt 3-phase Meter Testing Equipment.
- (2) A 0-50 kV. Oil Flash Test Set.
- (3) A 40 gallon per hour Oil Purification Plant.
- (4) 2500 volt Megger Test Set.
- (5) 1000 volt Varley Loop Megger Test Set.
- (6) 500 volt Megger Test Set.
- (7) Megger Earth Test Set.
- (8) Recording Ammeters, Voltmeter and kW. Meter.
- (9) 11 kV. Electrostatic Voltmeters for voltage measurement and phasing out.

In addition, there are the usual voltmeters and ammeters. Items (2) and (3) are at present on order but the balance are to hand. The meter testing equipment I regard of prime importance because by its use not only are meters tested and checked, but, all voltmeters and ammeters are calibrated and scaled, so that in the event of C.T. change there is no necessity of sending equipment away for checking and calibration with the possibility of damage in transit.

The balance of the equipment had been ordered by consulting engineers prior to my arrival.

However, on the basis of priority, I would suggest that municipalities of this size should first invest in the Megger Testing Equipment, but not the list given above. I would advocate the exclusion of the 1000 volt Varley Loop and Megger Testing Equipment and the 2500 volt Megger Test Set and the substitution of these two items by a 2500 volt Varley Loop and Megger Test Set if procurable.

A Megger Earth Testing Set is an essential, though as an instrument for testing earth resistances it leaves a lot to be desired, and the necessity of having adequate time available for testing a number of times is all too obvious. When discussing electrode boilers and the earthing thereof, the problem of earthing generally was only just touched upon. We found that with the early rains the top of the soil gets wet and when using a link stick or operating gang links, very severe shocks can be obtained, because the operator gives a better path to earth than the earth mat buried 6 feet underground, and to which the moisture has not yet permeated. In order to obviate the danger to personnel the following has been adopted:—

- (1) All personnel are to wear dry rubber gloves when using link sticks or operating 11 kV. Gang Links.
- (2) Two earth mats are buried, one in the horizontal plane at a depth of six feet and the other in a vertical plane, the top of the mat being about six inches below ground level.

However, I appear to be digressing from the point.

The next essential after the small equipment and meter testing equipment is the oil testing and purification equipment. I put these items in this position because of the grand co-operation of the Electricity Supply Commission who have always loaned us the necessary equipment in the past. With an application however, for increased area of supply it is necessary to have this ourselves, to obviate the possibilities of delays during the rainy season, and because if an application of the sort quoted above is made Council can no longer either on practical or moral grounds rely on the big brother for protection and

support and must be prepared to accept the responsibilities involved as well as the profits.

The final piece of equipment is a High Pressure Test Set for testing cables and for fault location. This equipment is only justified on the basis of the amount of cabling being laid per annum and the total length of H.T. cabling installed.

The main point which I extract from Mr. Mathews' contribution was his inability to appreciate the difficulties in obtaining adequate discrimination for our protection on the basis of the figures quoted.

It will be noted from the paper that the scheme was designed by consulting engineers. In fact the equipment was already being installed when I arrived on site.

The figure attached gives a single line diagram of the system. All rings are operated as open rings.

It will be seen from this layout that any earth fault between the points marked X will bring out the breaker A, and in point of fact does so.

Fortunately the trip coils in breakers B and C are 2½ amp trip coils, and so by replacing the instantaneous trip coils, by means of relays on breakers A and disconnecting the relays from panels D altogether and using them as isolators only, while replacing the 4 amp T.L. fuses on breakers B and C with 2 amp T.L. fuses discrimination can be obtained. Thus the main board bus-bar protection would be afforded by the Electrical Supply Commission's breakers, which is not good practise but one which expediency indicates in this case.

The fault lies with the original design, where we have low C.T. ratios, because the small load was divided up into too many circuits. I hope that this diagram illustrates my point to Mr. Mathews' satisfaction, and, if he desires it, further details will be given.

Mr. Milton's contribution was handed to me at the Convention and I feel that he is deserving of a very hearty vote of thanks for this very comprehensive document.

Firstly, I would like to state that the suggestions for preferential treatment were

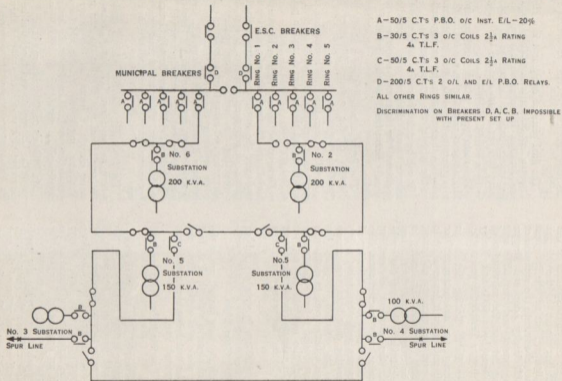


FIG III.

by no means desperate but given only after very considerable thought. It will be found, no doubt, on examination of the records of small towns that the supply of electricity is the one remunerative service which they possess. Although not stated as such my plea in this respect is for extended loans to be applied to such non-remunerative projects as roads and streets, to just quote one.

The load growth of Que Que is approximately 10% per annum which ensures that the present provision of main board will become redundant for that purpose long before the expiration of the life expectancy of the equipment, and I agree that it is not wise to burden any undertaking with two lots of loan charges on the same equipment.

I would plead forgiveness for the insertion of small additions to my paper when actually delivering it, and in this connection taking advantage of replying to certain aspects of Mr. Milton's contribution before he had given it, but this was not done for this purpose but because it was essential to add them in order to round off the picture.

Regarding the inaccuracies of Figure 1, Mr. Milton is quite correct. I wish to apologise and to state that the whole graph from the beginning until the point plotted between 1955/56 should move to the right, one space while the points plotted between '57/58 and '58/59 are estimated correct.

However, comparison of the consumption now with that of a decade ago shows an increase in consumption of 2750% in 10 years, based on consumption in 1946, which I admit is fantastic, but which is accounted for to some extent by the lack of progress during the war years, and also by the small initial consumption figure as a base.

I do not agree with Mr. Milton's remarks to the effect that provision for the increase of load over the next fourteen to fifteen years is a burden to the present ratepayer population.

Smaller size cables and lower rated switchgear would not greatly have reduced the cost while the annual losses would have increased, but in our particular case I would agree that the system provided is far too elaborate for present conditions and

a simpler, less costly system, would have been quite adequate for many years, and the subsequent developments could have been made as and when justified. This is where consulting engineers play a large part. In this case under discussion consultants were called in to design the town's H.T. and L.T. reticulations. It is all very well to design a system which is theoretically perfect, but consulting engineers have a duty to their clients, and that is to be sure that the system is based soundly on economics and the ability of the town to pay for the scheme. In all cases it is regrettable to say consulting engineers do not always consider the interests of their clients. I feel also that Figure III. helps to illustrate this point.

To illustrate this point more fully let me quote an example:— In considering the load growth of this town and the system to be installed the consulting engineers obtained figures of expected population increase for the next ten to fifteen years from some Government department. This showed an increase of ninety (90) residences, forty (40) commercial houses, twenty-five (25) industrialists, and one (1) Government office per year for the period 1953 to 1963 being an increase of 1,560 consumers over the period, being over 300% increase on the present town size, and the graph drawn was a straight line.

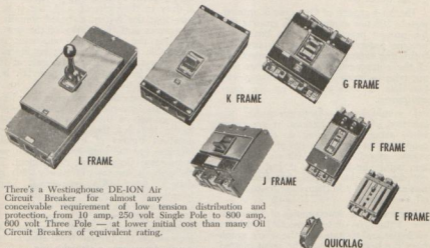
A little bit of thought would have indicated the following:—

- (a) That there are not sufficient builders to cope with such a programme.
- (b) That the population increase was quite beyond the capacity of the town.
- (c) That with such increases in a town the size of Que Que the rest of the country too would have boomed even more than at present and that our railway system would not have had any hope of coping with the said increases of population alone, not to mention building materials and the 101 other requirements of an immigrant population and secondary industries.

Thus the consulting engineers took the line of least resistance, quoted Government figures and went ahead, secure in the knowledge that they could not be wrong, and acting in my opinion, wrongly.

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Mr. Milton's remarks regarding the increases of network capacities are fully appreciated and will be borne in mind for future extensions but cannot be taken advantage of in the present area already served.

With reference to the subject of expansion, no further comment is necessary, except to state that Mr. Milton has stated the problem far better than I did and to add my pleas to his in the hope that Councillors will give a far more detailed consideration to the problem of expansion than they have in the past.

With reference to the remarks regarding protection, I have already dealt with these.

In regard to the percentage of the cost of electricity to the industrial consumer in relation to the total cost of production, while in general I must agree with the remarks, nevertheless in Southern Rhodesia this does not altogether apply. The small towns between Salisbury and Bulawayo all draw the power supply in bulk from the Electricity Supply Commission and do their own distribution, but if we consider the establishment of townships by the Government where individual industrialists are supplied directly by the Electricity Supply Commission then the situation can arise where the industrial consumer can be quoted a tariff comparable with the tariff available to the small municipalities, and thus the situation arises where small municipalities tariff will not compare favourably with that which may be available from the Electricity Supply Commission direct.

In Rhodesia distances are large and it is quite common for people to visit one another travelling 30 or 40 miles to do so, so that a township arbitrarily sited say 35 miles from a large town would enjoy the amenities and facilities of a large town, especially if on the main road, as well as the obvious benefit of the best possible tariffs, bearing in mind the contributors remarks on diversity and tariffs.

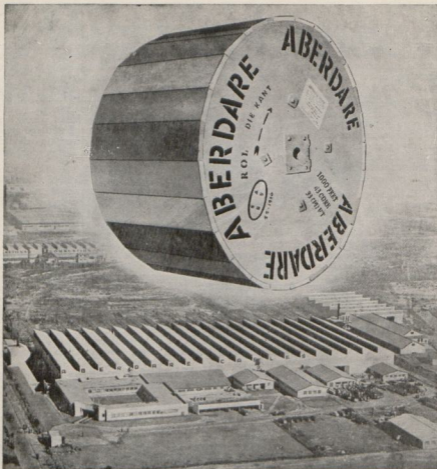
It was with these facts in mind that I made the pleas for certain preferential treatment.

In respect of the other remarks contributing to the loss of industrialists, mention

was made by me in the paper that a revision of railway rates would be advantageous. The incidence of railway rates on raw materials and manufactured articles is designed in this country to benefit the two large towns and the copper belt. My proposals here, in brief, are that all distribution rates should be abolished and railway rates should be based purely on mileages, and further that the railrage rates on base minerals of all description should be on the same scale or higher than for manufactured articles.

While I appreciate Mr. Milton's approach to the problem of providing for load increases of say 800 kVA. over a period of a year and the difficulty when considering this type of problem, with the additional consideration of generating plant and extended delivery periods, nevertheless, the converse is also true. Should the generating authority expand to meet anticipated load growths which do not materialise the bulk consumer pays an additional charge to cover interest and redemption on plant standing idle. With the rate of expansion of the electrical industry in Southern Africa generally this is hardly ever likely to take place, but I know of one case where it has, and, as apparently the opportunity of establishing a tariff stabilisation fund had never occurred, the bulk consumers were burdened with increased tariff charges, the structure of which was mainly interest and redemption charges. To take this to its final conclusion. What would the position in the Federation be if when Kariba is in operation the load does not meet the anticipated figure, and thus not only is Kariba not operating to maximum capacity, but the thermal stations are idle? Of course the total costs may not be reflected in electricity charges, and could be met by other forms of taxation, but if it is purely paid for from revenue?

With reference to peri-urban expansion, while I do advocate such expansion in peculiar instances such as our own, and while I do agree that such expansion will not be beneficial in all instances I do advocate that each and every local authority and particularly the small ones should conduct a very extensive survey into the possibilities of such expansion and into the costs and possibilities for the future, and



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where found worthwhile an endeavour be made to take over these areas.

Finally, Mr. President, I would once more like to thank Mr. Milton for his very exhaustive and fine contribution to my paper.

Mr. Turner's contribution comes to me as a bit of a surprise in so far as his views on nationalisation are concerned. No doubt if he looks back on the history of his undertaking he will find that electricity supply was the only remunerative one when the town was small and at that stage the Council could no more have relinquished the profits from the department than they would consider relinquishing them voluntarily now. The case for nationalisation can always be produced by those who feel that they are not effected for others less fortunate and the attitude of pious helpfulness to such has a ring of insincerity all too obvious these days.

When discussing testing equipment, the cost of £5,000 was arbitrarily chosen for comparison purposes, but details of testing plant have been given earlier and this point will not be mentioned again.

When considering problems which arise in a small undertaking one is loath to approach at first the larger ones for help, and it is thus with great pleasure that I listened to Mr. Sibson's remarks. I shall certainly bring his suggestions to the notice of my Council and will further avail myself of his generous offer when necessary.

Finally, Mr. President and Gentlemen, let me thank you for your patience and understanding and state that my only regret is that the smaller municipalities did not avail themselves of the opportunity of adding to the discussion when this was presented.

THE PRESIDENT: Thank you, Mr. Yodaiken. I am going to throw open Mr. Lynch's paper for discussion.

Mr. MILTON (Johannesburg): Mr. President, I would like to congratulate Mr. Lynch on a most valuable and informative paper. There are one or two aspects I would like to deal with in a brief discussion a resumé of what I have prepared more fully in writing. In the first place I think it very significant to note that only 1% of

the units sold in this area was used for farming purposes, in spite of the fact that Salisbury is not well industrialised. Had they had a substantial industrial load, that percentage of use by the farming community would have been an even smaller figure.

I am stressing this fact because it does bring home to all of us the difficulty of developing the farming load, although the farming load is to some extent very urban, as far as Salisbury is concerned it is an extensive area and it is pleasing to know that there is almost 100% coverage. With these figures in mind when farmers talk of obtaining subsidies for the development of their supplies, I think we can bring forward some facts to persons responsible for deciding whether or not subsidies should be granted which would illustrate the value of those subsidies.

It has been noted particularly that the rate of growth of the use by individual domestic consumers which is obtainable from the figures in the paper is of the order of 7% per annum, that is the individual consumer is increasing the use of his electricity at that rate. This is a figure which our friend Mr. Kane, the President of the Institute, in his address to the South African Institute of Electrical Engineers dealt with, and it is noteworthy that it is very similar to Johannesburg's own experience. At that time I had the honour to propose the vote of thanks to Mr. Kane, and I was able to give the figures which showed that in Escom's own case over a widely scattered range of domestic supply groups we had definite proof of exactly the same tendency. The difference in percentage of rate of development as between various parts of Escom that is from the Cape, Witbank, Natal, were so small as to enable one to say that approximately the same rate of growth is occurring throughout the Union.

It is interesting to observe that that rapid growth is occurring in the Rhodesias. What I am leading up to is the fact that whilst Salisbury is in the fortunate position of leading the world in the number of units used for domestic consumer, with their rate of growth Johannesburg is right on their tails, so are we, but unfortunately as we all seem to be retaining the same speed, Salisbury will retain the record. I think

here is the point: what is going to happen after about 10 or 20 years at that rate of growth? I don't know! We will have to have miniature power stations in each home.

The 15% rate of development of maximum demand in Salisbury is indicative of the rate at which this country is expanding as compared with other places, there are not many parts of the Union where we can claim that rate of growth. At the moment Johannesburg is still quite rapid. My friend on the right here is falling almost into the discard with his rate of growth, I won't mention what it is because I don't think he is very proud of it. Oh it is seven now, I thought it was four. Anyway we are getting conditions of that description now especially in the larger places where the further development is restricted to a development up into the sky instead of spreading out over the surface of the ground, a temporary lull in my opinion which will be followed by an acceleration thereafter of much the same rate that we have experienced everywhere.

The feature, however, which I think we have all got to watch out for very carefully is once again stressing that old point: if we encourage a development uneconomically, we are really wasting a capital and that we should use our best endeavours to develop a load in such a way that we are making the best use of all capital equipment installed. From that point of view our efforts should be in the direction of trying to improve load factor. There are advocates for special off-peak tariffs for night loading in order to achieve that end, but in general I think we might again be accused of encouraging people to endeavour to operate during night hours. For those people to find that in the long run they can't get the labour conditions suitable for that type of operation (people prefer to work during daylight and use their night hours in other directions), and, from that point of view, although you might encourage someone to start up in night-time operations, they will probably revert to day and then come pleading for special terms for day because their particular industry requires a continued low rate of supply.

As regards the increase in our unit rate which is occurring, which is inevitable with the rising costs of manpower, fuel, and other variable costs, I don't think we should be so very worried about it from the point of view that electricity, after all, is competing with other forms of energy, and that competition must continue. Whatever is causing a rise in our own unit rate, that is, cost of fuel and things of that sort, is catered for in this competition by reason of the fact that those same factors influencing increasing prices are applicable to the competitive sources of energy. In other words we still remain better than the alternative, although we are facing a rise in prices. To adopt a unit rate which is fictitiously low in order, shall we say, to maintain water heating is to my way of thinking very, very bad practice. I am a firm believer that the man who uses electricity should pay for it. This touches on the supply of electricity to the Native houses and there I would like to make the suggestion that a nominal charge be raised against the users of electricity in the area, in addition to fully covering the cost in the rent, because then if you get a more extensive use by the Native he will pay for that use. I think it is a characteristic of the Native that what he pays for, he values, what he gets free is rubbish. He would use it, use it to his own advantage, but he would have no regard to any pleas you may put to him to the effect that he is abusing the privilege. Let him pay for it, and I think you will get economy. That, I think is exemplified in the figures actually given in the paper, where the Author has mentioned figures of units used for lighting, units used on an average where a hot plate has been installed. If you would examine those figures you will find that the Native has got his hot plate in use for over seven hours a day, every day seven days of the week. I don't think that the Native requires a hot-plate for that length of time.

As regards the pulverised fuel side, I would like to sound a note of warning. After all, Escom pioneered pulverised fuel in this country. I think we are in close competition with our old friend Hooper from Robertson, but at Congella as you

know, pulverised fuel is installed. Now that was done for more than one reason. It was done for the utilisation of the Natal duff waste product, but also it was done with a view to using coke breeze. Dr. van der Bijl at that time, had in mind the development of a fairly large coking industry, and the coke breeze would become a waste product and the Congella Power Station would be a very suitable instrument for absorbing that breeze instead of wasting it. However, that has never happened, and Congella is operated on the Natal duffs. In the Witbank area we built a Power Station a little earlier than the Congella Power Station where duff is burned, on chain grate stokers. It is not quite a pure duff because it contains some of the particles that normally go into a pea coal. But the quantity of the "plus a quarter" in that coal burned at Witbank is negligible. One can virtually say, therefore, that in those boilers we have produced a grate which can effectively burn duff coal. I won't go into technical details, it is all a matter of control of air ignition, and draught, and keeping the coal more or less floating instead of stagnate on a grate. But, and here is the most important feature that we must watch out for, the duff coal used in both these generating stations was a waste produce when they were built. As a waste product a nominal price was fixed, speaking from memory I think it was 1/6 a ton at Witbank. The price we are paying for that coal now is 9/- a ton, and, Gentlemen, we put down our own sidings, provided our own locos and trucks for the haulage of that coal, so that is a straight increase of the cost of a product for which the boilers were designed.

When one gets that type of increase in the cost of the fuel, efficiency becomes more important, and from that point of view if we built Witbank again I would venture to say that we would build it for peas and not duff. The point I am making is that we are developing a market for that waste produce, and by so developing that market we can produce a condition where the sellers of the product will say "look, this is no longer a waste product, look how much is required—as much as is produced." Then they begin to bring it into correlated

value with the rest of their products. I think some very definite and very long term undertaking as regards prices is very necessary if you are going to build a station for the utilisation of what is almost virtually a waste product. Another difficulty with your pulverised fuel is moisture. Just recently we have had a very very bad time at Congella due to wet coal. The actual total moisture has been between 10 to 15%. Under those conditions that pulverised fuel coal will not flow, and it is the devil's own job to move it. We have had gangs of boys ramming it whenever the coal has become stagnate, but nevertheless there was one day when we were burning the wet duff when there were so many interruptions that it was impossible to log them, 10, 15, 20 failures of pulverised fuel fires in a day have not been uncommon. So I would warn Salisbury to watch out for the question of moisture. In our own case it was due to the recovery of coal from an old dump which had become almost water-logged with rain. We were told by the Suppliers of the coal that they had no other duff to offer us, and we had to burn that. We tried, but there is tremendous risk of damage to plant and machinery through explosion, as well as to the operating staff.

They are certainly very useful for quick response and from that point of view they will be a very valuable asset to Salisbury and the Federation. But another aspect to the use of pulverised fuel where one must be careful is that the trucks into which it is loaded, if it is to be transported any distance, must be in good condition. I hope in the Rhodesias you have a little better experience than we have in the Union at times. Sometimes a truck will arrive a quarter full due to some small hole having developed and this stuff leaks out almost like water. The Railways, of course, take no responsibility for loss of coal in transit, and we pay for nothing at times.

As regards the township side, we adopt the same method as has been mentioned previously. We call upon the township companies to finance. We reimburse the companies on a definite basis, but we establish a minimum charge before any revenue is attributed to the repayment. That minimum is based on the cost of bringing the service to the township, not on



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the distribution in the township. But we also go a step further, and we require the township to make a payment to us at the rate of 5% for all outstanding capital. In other words, the capital which has not been refunded to the township company is covered at the rate of 5% per annum to cover the cost of maintenance, distribution, and services. Thank you, Mr. President. (Applause.)

CONTRIBUTION TO DISCUSSIONS
ON Mr. E. C. LYNCH'S PAPER ON
"SOME ELECTRICAL DEVELOPMENTS IN THE SALISBURY AREA"

Submitted by

Mr. W. H. Milton (Johannesburg).

Mr. President, Gentlemen, we are once again grateful to Salisbury for furnishing us with a very instructive and valuable paper.

In introducing this paper the Author draws attention to the growth which has taken place since the last Convention in 1945. At that time I was one of those who were fortunate enough to be present and I can assure him that I have been amazed at what has taken place in the intervening years. Much of this progress was forecast by our old friend Mr. Clinton who was our host at that time but who unfortunately is not present today because of the need for his services in the Cape. I am sure we all miss him at this particular time.

The information submitted regarding the proportions of electricity used by the various classes of consumers in this town are very interesting and in particular the fact that less than 1% of the units sold are consumed on the farms should bring home to us all the relative magnitude of expenditure in the direction of supply to this type of consumer in relation to the utilisation of the service by this class. The significance is also emphasized by the fact that the Author states that almost 100% coverage has been provided in electricity services to the farms in the relatively large area which falls within the Licenced Area of Supply of Salisbury.

The average consumption of electricity in Salisbury is indeed a credit to the efforts of this Electricity Undertaking to give service

effectively to its consumers. At this point I would mention that, from the figures given by the Author at a later stage in his paper it is to be observed that the rate of increment of electricity used per domestic consumer is very similar to that experienced increment of electricity used per domestic consumer is very similar to that experienced by Escom and mentioned by Mr. Kane, the General Manager of the Johannesburg Electricity Department during his Presidential Address to the South African Institute of Electrical Engineers. In this respect therefore the advance in Salisbury is so similar to that experienced in the Union that we may be justified in looking forward to the day when our consumers generally will, on the average, consume some 750 units per month each. At that time, Salisbury may still remain in the position of putting forward a world record if it can only maintain its rate of increase in use of electricity per consumer.

It is also noteworthy that the increase in the rate of connection of consumers is of the order of 16% per annum. This percentage of course would have the effect of somewhat lowering the rate of increase in use of electricity per consumer because I think it is fair to assume that new consumers do not make as much use of electricity as the older consumers who appreciate more and more as time goes by the advantages of electricity when applied in every direction freely.

The rate at which the Salisbury Undertaking has developed as illustrated in Figure 2 shows the wide fluctuations year by year which can only be attributed to the acquisition of relatively large loads from time to time and possibly an increase in population accompanying the acquisition of such loads.

It is noteworthy that Mr. Lynch is satisfied that the average rate of growth of load of 15% per annum maintained over the past 10 years is expected to be sustained in the immediate future. This is a higher rate than is expected in the Union of South Africa and considerably above the average.

The high average rate of use per domestic consumer and the relatively high increment in load is stated to be dependent largely upon the maintenance of low rates attractive for water heating.

Whilst every effort must be exercised in this direction by Supply Authorities if we are to do our duty to consumers, we must not lose sight of the fact that those factors which lead to an increase in the unit rate are also factors leading to an increase in the cost of competitive alternatives to the use of electricity. A rise in price of electricity does not therefore mean that it ceases to be attractive to the user.

In this connection the relatively rapid rise in the price of capital equipment has had a marked effect on most electricity supply undertakings. Whether it can be said that a lower rate of growth produces, in effect, a "cushion" is rather doubtful. If the rise in cost is to be say 5% per annum (this is not a realistic figure but is used for the purpose of my argument), an undertaking doubling its plant in say four years would be faced with an increment of cost of 20% in respect of the new plant which would then give an average price overall of say 110% of the original cost per kW. installed. If eight years is to elapse before the additional unit of the same size of the original unit is added, the increment in cost of the new plant will be 40% and the average price would be 120% of the original cost per kW. The undertaking developing more rapidly will naturally require plant at the end of that eight year interval presumably to double the then existing plant and the overall increment in cost at that stage will be slightly greater related to the original cost per kW, than in the slower growing system. What I think is far more important, however, is that the rapidly growing undertaking will increase its tariffs by say 10% with the first installation and something less than 10% with the second installation whereas the slower growing system will be faced with an increment in its prices of 20% in the first instance of price rise.

Consumer reaction to 10% increments at four yearly intervals is far less strong than when a 20% increment is imposed even though those consumers have enjoyed no increase in costs for a period of four years longer than their neighbours where the development has been more rapid.

Where it is possible to do so, and where it seems evident that further price rises in capital equipment are to be expected, I feel

it would be wise to increase the prices for electricity although such increases would result in surpluses pending the time that will come inevitably when a price increase will again be necessary in order to meet the higher cost of capital equipment in the future.

It is not an easy matter to convince a municipal council of the wisdom of this policy because the council may be regarded as acting as a buffer between the consumer and the electricity department with a view also to keeping down the charges to the consumers concerned. You will observe that I am not dealing with amounts required for relief of rates—our hardy annual.

As regards the additional generating plant to be provided on this undertaking, it is interesting to observe that pulverised fuel firing has been adopted. As we are all aware, this system of firing has not been promoted within the Union of South Africa although the generating station built at Congella was the first of its kind introduced into the Union and was so introduced with the possibility of the extension of that type of firing on Escom's undertakings.

Whilst the chain grate stoker system of firing has been criticised by the Author on the grounds of the outages which have been caused by that item of plant, it is quite evident that the experience in the Union is somewhat different otherwise one could reasonably have expected a wider use of pulverised fuel firing in the Union.

Much depends upon the quality of the coal available and also the availability of duff which, if sold at a reasonably low price, assists in compensating for the cost of providing pulverised plant and operating those units as auxiliaries in a generating station.

Whilst duff coal in the Union was originally regarded as a waste product, the provisions which have been made, principally by generating authorities, for the incorporation of duff with pea coal (to produce mixed smalls) or even the provisions which have been made for burning duff coal on chain grate stockers and in pulverised fuel boilers, have led to the establishment of a relatively large market for what was formally a waste product.

This in turn has led the Coal producers to regard the duff as a valuable marketable product and in turn to an increase in the selling price of this commodity.

An examination of conditions in the Union at the present time will show clearly that the abandonment of duff in the coal burnt by new generating stations would be fully justified on the grounds of improved efficiency of operation and lower cost of boiler plant and equipment in consequence. Unfortunately, at the present time, there is a shortage of coal and one may say that in such circumstances there is no free competition.

Whether or not similar conditions are likely to prevail in the Federation I am unaware but it would be well for power supply authorities to bear this possibility in mind when designing new generating stations. In order that this aspect may be better appreciated, the price of pea coal in the Transvaal is now 10/2d. per ton at the pithead for coal below 12 Evaporative Units calorific value and 10/11d. per ton when the calorific value is 12 Evaporative Units and more. The price of duff coal is 8/4d when the calorific value is below 12 E.U.'s and 8/10 per ton when the calorific value of the duff is 12 E.U.'s or more. These pithead prices exclude the present levy on all railed coal which amounts to 10d. per ton. No useful purpose would be served in quoting prices for the Natal coalfields because the price structure in its incidence on the cost of coal to power supply authorities is very different varying very markedly from pit to pit and having no regard to the calorific value of the coal from any one of those pits.

Of course the choice of pulverised fuel firing at Salisbury is very considerably supported by the conditions likely to prevail when supply is obtained from the Kariba Gorge Scheme. The more rapid response of the pulverised fuel type of boiler makes it ideal for picking up load quickly and for use for peak load purposes only.

The moisture content in the coal both inherent and superficial is of extreme importance where this type of plant is concerned.

My remarks on this subject have been inspired more particularly by the Author's statements that the ability to burn any grade of coal which may become an important economic asset should quantities of otherwise unsaleable fuel be accumulated. As I understand this statement it would appear that the Author has in mind the accumulation of otherwise unsaleable coal produced from the Wankie Coalfield, and this in turn implies the accumulation of duff screened out from this mined coal. It is noteworthy, however, that the Author has stated that the coal used can be selected almost entirely on the basis of the cost per B.Th.U. delivered. Some further information on this cost structure would be of great interest.

Coming next to the Author's remarks on the distribution section, I would be interested to learn what the connection fees are as applied in the Salisbury area and in particular what difference becomes applicable if underground service connections are required in place of the overhead service connections.

The Author has furnished us with some valuable information regarding the comparative costs of three-phase and single-phase service connections to residential premises. For a long time it has been felt that the original maximum load acceptable on a single-phase service connection had been set far too low and with rising prices this has become abundantly more and more evident.

In his comparative Table of Costs the Author has not given the total cost of the main feeders from overhead lines to cut-outs but only the saving in expenditure on these items.

To many of us the actual cost of the service connection from the service mains up to the meter itself would have been of particular interest.

In many cases it is the practice for the supply authority to supply at its own cost the overhead service connection from the service main up to the shackling-off point on the consumer's premises, the consumer being required to meet at his own cost the remainder of the service connection from the shackling-off point to the meter on his premises. A connection fee is also charged

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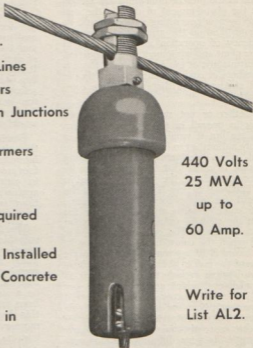
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by the supply authority which usually is a lesser sum than the actual average cost to the supply authority of providing the overhead service connections. Exceptional lengths of service connection call for the payment of an additional fee by the consumer concerned. What practice is adopted in Salisbury has not been mentioned.

I hope that the Author's comments on the relative cost of reticulating electricity in township areas where development is planned in the interests of density of supply as compared with other areas where no such precautions are taken will be noted by those persons responsible for the development of townships and also by persons interested in the purchase of land in township areas.

The sparsity of load and the extensive distribution required per consumer is an important factor in the pricing of electricity to users.

The figures quoted from which the cost per consumer of reticulating these sparsely populated township areas can be calculated, are almost frightening. You will observe that the cost per consumer in capital investment in the township reticulation alone has amounted to £750 which would require for capital charges and maintenance alone a return of the order of £1 per month. To this of course must be added the cost of the feeder into the township area and the cost of generating plant utilisation.

Whilst the Author has expressed the view that any requirement that an estate owner should meet the cost of providing the electrical services would not discourage the land speculation as the extra cost of electricity reticulation would merely be added to the cost of the building plot, I am not in entire agreement. If the township company is called upon to meet the capital outlay on the electricity reticulation network, it is most likely that the township company would agree to the development of the township by way of zones in order that its capital outlay may not become excessive.

Legislation calling upon a township company to make adequate provision for roads, water supply, and electricity supply before plots can be sold would, I feel, go

a long way towards avoiding the sale of a very large number of plots scattered over a wide area regardless of cost of furnishing supply of electricity in that area if peaceable development is permitted.

If the area is relatively small and even if the cost of the reticulation network is added to the price per plot, provided the price per plot is not increased to such an extent that land cannot be sold, something may be said for the owners providing the capital for the development of the reticulation network.

As regards the reticulation in the intensely developed areas such as the commercial and flat residential areas, the Author's advice regarding the use of air-cooled transformers is of very great interest. Supply Authorities do not often have regard to the effect of the inclusion of substations in their premises on the cost of insurance as it affects the consumers. I feel that we will all benefit from this positive disclosure by the Author. Some further remarks on the cost of upkeep and maintenance would also be of great benefit to the members of the Association. It is a long time since I encountered any of these units. The last one which I saw was in a very bad state having accumulated so much dust over the years that ventilation was almost completely absent. The impression made upon me at the time was that, if ever I had anything further to do with these units, I would always bear in mind the necessity for clearing accumulations of dust from the windings.

The notes regarding the occasional overloading transformers are also very valuable. One is apt to overlook the fact that the extent to which the life of a transformer is reduced by these occasional overloads is negligible when compared with the extension of that life by reason of the fact that for the majority of the time the transformer is very much underloaded. These compensating features therefore enable occasional overloading to take place without detriment to the finances of the undertaking.

The other efforts at economy mentioned by the Author are also of interest but one is led to wonder why the Author does not mention the extent to which the peak loads were actually reduced by the introduction

of the ripple control of water heating. Perhaps his statement of the estimated peak load of 71,200 kW. was arrived at by adding the extent of load-reduction which occurred when the ripple signal was sent out to the actual following maximum demand of 64,600.

If this is not the case it seems to me that the effect of the ripple control could be estimated by taking into account the reduction in demand which occurs when the ripple signal is sent out in the first instance and also the increase in the maximum demand when the following ripple signal is sent out to reconnect the water heating load. By averaging these two figures the extent of the reduction should be approximately very closely bearing in mind that during the interval of disconnection a number of water heaters would probably require supply and therefore the increment in load at the end of the period may considerably exceed the average load had a supply been available for water heating throughout the period of disconnection. Some further comment by the Author on this point would be much appreciated.

As regards the loading in the Native Housing Area, the figures given in relation to the use of hot plates seemed to be indicative of the wasteful use of this type of appliance by this type of consumer. The average figure of 200 units per month where a hot plate and lighting is used, taking into account the fact that the lighting requires only about 20 units per month, leads one to the conclusion that these hot plates are left in circuit daily for seven hours per day. This seems to be an excessive time for the general cooking requirements for which the hot-plate would probably be used. If the supply were metered and only some token charge applied in respect of the number of units used, I feel sure this type of consumer would practice reasonable economy. There is nothing like touching a consumer's pocket to prevent waste.

In conclusion I wish to express my appreciation to the Author for the obvious trouble that he has taken to cover the important aspects of a very extensive subject in a minimum of time taken in presentation.

I must also say, Mr. President and Gentlemen, that the remarks which I have made in connection with this paper are my own and must not be construed as representing the opinion or policy of the Electricity Supply Commission of the Union of South Africa.

THE PRESIDENT: Thank you very much, Mr. Milton, for a very excellent contribution to the paper. Any other contributions?

H. T. TURNER (Umtali): I would like to add my word of praise to what has been said about Mr. Lynch's excellent paper. I was particularly interested in that part of the paper concerning distribution,

Salisbury City I notice are still continuing with the system of overhead low voltage reticulation which surprises me in that modern and growing city. Admittedly underground cable reticulation is a little more expensive, probably 25% more than overhead construction, but I would have thought the reduction over the years in maintenance costs together with the overall improvement in the aesthetic appearance of the reticulation would have been well worth while.

In the low cost housing reticulation, such as Mabelreign as mentioned in Mr. Lynch's paper, the reduced costs of providing services has brought about a reduction in connection fees. This is understandable but I am at loss to appreciate how a reduced tariff for the supply to these closely built up townships is arrived at. Domestic tariffs in the municipal area are surely standard throughout for all consumers except, of course, for a variation in the minimum charges.

I agree with the Author that the cost of servicing of peri-urban areas presents a problem, particularly in these days of shortage of capital funds. In Umtali we have met the position to some extent by taking the high voltage supply to some central part of the area to be reticulated and when a low voltage extension is required the consumer is charged a connection fee made up of the expendable or irrecoverable costs, such as labour erection costs, transport, consumable stores, etc., involved in making the extension. Perhaps the better way as suggested by the Author

would be for the estate developer to add on to the cost of each plot at the time of sale, a pro rata amount of the total cost of reticulating the whole area with electricity.

I notice from Figure 6 that flying fuses are not used on house service connections. I would like to ask the Author whether or not this is standard practice in Salisbury and if so whether this procedure together with the use of the fully insulated phase wire is done to reduce stand-by maintenance costs and if so has it appreciably reduced such costs.

In comparing the use of aluminium with copper for overhead construction I am surprised the estimated saving is not more than 8%. As the Author's calculation is apparently based on a copper price of £300 per long ton perhaps a more favourable comparison would be achieved when calculated at the present day price of approximately £430 per ton.

I fully substantiate the Author's remarks concerning the use of radio telephone equipment. What some of the smaller municipalities might not appreciate is the fact that one system can be installed to accommodate the requirements of more than one municipal department. For example, in Umtali the one V.H.F. radio telephone system is used jointly by both the Electricity Department and the Town Engineer's Water Department without any difficulty at all. Furthermore where water intake-works are situated some considerable distance from the town the further extension of the V.H.F. system to provide telemetering is also most advantageous to a local authority.

The Author mentions the fact that the Consumer's Section of the Salisbury Electricity Department carries out departmental electrical wiring installations, which of course is quite common practice, but I must say I was very much surprised that this section is so geared and set up that it could take in its stride the wiring installation of one of the largest buildings in Salisbury, namely Trafalgar Court, a building containing 144 flats, 60 offices, 7 shops and a restaurant. I submit that even for the Salisbury Electricity Department this is quite an achievement and perhaps the Author could give some idea how the final

departmental cost worked out in comparison with the costs that would have been made had the work been done by a firm of private wiring contractors.

With reference to the use of 13 ampere switch socket outlets on 7/036 ring main circuits, I notice that electrical manufacturers have now marketed a 3-way multi-adaptor which when used on these 13 amp. socket outlets will permit a maximum of 39 amps. to be carried on each such socket outlet. The danger of this practice is obvious and completely destroys the security of the circuit. Consumers should be notified of the danger involved in this practice.

Furthermore, as Mr. Lynch points out, all consumers who have these 13 amp. H.R.C. socket outlets installed should be warned of the danger of substituting such fuses with copper or other wire when a replacement is necessary, perhaps even to the extent of fitting a small label on the main switchboard stating that only H.R.C. fuse replacements must be used.

I personally have always had doubts about the merits of installing ripple control gear on a municipal electricity system. As a means of staving off the day when new generating plant will be necessary or in certain instances where there is a general temporary shortage of generating plant and it is necessary to control peak loads such as pertains in the Witwatersrand today possibly the installation of ripple load control can economically be justified. Where, however, power supplies are more than adequate the position is quite different. For example, I can see no justification whatsoever in an undertaking connected to a large thermal generating grid system or say, in this country, to the vast potential reservoir of power from Kariba to warrant the installation of ripple load control.

I agree with the Author that the sale of electricity in Native townships is likely to increase very rapidly in the foreseeable future. A note of caution should be given in this respect however because the Native, the Rhodesian Native at any rate, has not by any means yet reached the stage where he has learnt to handle electrical appliances with any degree of care and is still very much under the mistaken illusion that electricity is produced at virtually no cost

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whatsoever. In Umtali we have, as Salisbury has done, successfully applied the use of electricity for communal cooking, heating and steam raising in the various Native clinics, hospitals, beer halls and breweries, etc. The success of these applications has been achieved because the appliances used are under the watchful care and supervision of Europeans. Where electrical cooking appliances have been installed in Native dwellings away from any European control we have found that it is quite a different story.

A number of solidly built hot plates were installed in this Umtali municipality's Native township in about a dozen Native dwellings for experimental purposes and after a period of three or four months all but two of the appliances were found to have been completely burnt out and in such a state of filth that we completely abandoned the idea of encouraging cooking by electricity in Native dwellings. On seven of these dwellings the unit consumption metered exceeded 2,500 units in one month due possibly to the hot plate being used throughout the night as a radiator.

Again when the Director of Native Affairs called for applications from Native residents in Sakubva township to have dwellings wired up for cooking and heating and separately metered, a considerable number of applications were received from the more affluent type of Native. When, however, they were informed that a monthly service charge of 2/6d. to cover the cost of the more extensive wiring was to be imposed and that electricity was likely to cost about 30/- to £2 a month to cover the cost of energy used by the appliances, the number of applications fell away to an almost negligible amount and the scheme was not proceeded with. Perhaps over the years when the Native is conditioned to the proper operation and care of electrical appliances and is made to pay for many amenities which are now provided free, the position might improve and quite a substantial demand for electricity by the African would be created but at the present the position seems pretty hopeless insofar as the average Rhodesian African is concerned.

Mr. FAINSINGER (Windhoek S.W.A.): I should like to endorse the remarks of the

previous speakers who refer to the high standard of the paper presented by Mr. Lynch, and to thank him for having supplied much useful information on current practice in Salisbury. It is particularly valuable to those of us who have no such ready access to the larger electrical systems. Throughout the paper the necessity for reducing capital costs is emphasised, and several methods are described which have resulted in valuable savings.

I am surprised, however, that no mention is made of the possibility of more efficient use of generating and distribution equipment which can be obtained by a more fundamental and realistic approach to tariff design. Mr. Sibson queried the wisdom of encouraging sales of electricity to the extent that it is used wastefully. I would go further in querying the wisdom of pandering to the whims of our consumers to the extent that we do. Engineers are usually horrified at the thought of introducing measures which could possibly be construed as a reduction in liberties. When I spoke about the introduction of a tariff with a maximum demand charge based on the rating of a miniature circuit breaker at the conference in Johannesburg a few years ago, I was criticised by several engineers who felt that such a tariff would tend to reduce the popularity of electricity as a service or have the effect of making consumers resentful or dissatisfied.

The then engineer of Durban in fact said that he believed in giving consumers what they wanted, when they wanted, and where they wanted, provided they were willing to pay, implying that the tariff I advocated did not comply with this requirement. Since then we have widened our experience in the use of circuit breakers for tariff purposes, and I am more than ever convinced that not only is their use fully justified, but that consumers soon get used to the idea of paying for the demand they make on the system and with few exceptions improve their load factors considerably. In Rhodesia where the ratio of capital to operating costs is increasing steadily I should think that this possible means of load factor improvement deserves more consideration.

With regard to the centralised control of water heater load I feel that there are many

disadvantages, some of which have been mentioned by Mr. Downie. Here again I feel that the logical approach is to educate consumers to the use of smaller elements and larger storage capacity. I should mention in passing that conditions in Windhoek are similar to those in Salisbury, and that the rate of growth of load is also phenomenally high and the average income of the population correspondingly so. In fact from the figures mentioned so far in the Conference I think our rate of growth on occasions has been higher than that in Salisbury: we have exceeded 20% on occasions. The main difference between the attitude of our respective consumers is that those of Windhoek are by now conditioned to accept them in a most co-operative and understanding way. It may be interesting to record that prior to removal of the original to the measures I have spoken about, and severe load restrictions we reached a 24 hour load factor of over 72%, and our load is also predominately domestic.

Capital savings of the order of 10 to 20% are in my opinion quite capable of achievement by the adoption of measures such as those outlined above. In Germany during the last 10 to 15 years a detailed study has been made on the costs of re-building bombed out areas. The conclusion so far reached is that it is more economical to add more and more substations to an existing network than to replace overloaded networks. The policy in Salisbury of providing for a large number of relatively small substations is therefore in line with these findings and present Continental practice.

A casual look around Salisbury system reveals an extensive use of concrete, many of the designs are most original and functional, and those responsible deserve our unstinted praise. I am unable to understand, however, why no use has been made of creosoted gum poles. Judging by the luxurious vegetation which almost obscures most of the overhead low tension net work, there should not be any difficulty in growing suitable trees for poles, and I am sure that approved methods of treating the wood would protect it against the local termites. Perhaps Mr. Lynch would give us his views. (Applause.)

THE PRESIDENT: Thank you, Mr. Fainsinger. Are there any further contributions?

Mr. GRIPPER (Port Elizabeth): Mr. President, I hope I have established a precedent for not being too long, I don't intend covering the whole ground of this paper which I find is so interesting and full of what we might call good meat that one is liable to become greedy and try and drag some more out of the Author. Nevertheless, I would like to mention that I feel the paper is of vital interest, and it is sine qua non that it is of interest to Engineers. But our Councillors will note that expensive economy items are recommended and established as being valuable: and even the consumers, if they could have heard some portions, of that paper would be interested.

Some 11 years ago we were impressed by a paper Mr. Clinton read here, in which he described the growth of Salisbury in hexagonal areas in one plane. But it seems now that the measurement is in cubic miles. I don't know whether you have maintained the original idea of hexagonal areas in two dimensions; I would like, nevertheless, to have the Author's opinion on that method of pre-planning an undertaking. There is no doubt that there is a considerable amount of foresight shown in this paper. It is obvious when one walks round Salisbury that preparations are made for supplies where they are likely to be needed. But foresight of this order has almost a snowballing effect; we read or hear of one power station in 10 years, or one power station per 10 years and at that rate, as has been said here already, it may be that the power station will have to be sub-divided into small units and put into individual consumers' premises. But Federal foresight now seems to be pushing Salisbury into special plant such as pulverised fuel, almost before some of us in the Union have thought it was warranted. Incidentally I would like to know why pulverised fuel is so much more suited for out-door use than say, a stoker job, if the Author can reply to that point.

1% of the total unit output for rural use is described as disappointing. It seems to me however, that seeing that the consumption per consumer is so very high, 1% of the number of consumers would be 200 and I think if there are 200 rural consumers it is not at all a bad job, but due to the

high unit consumption per head in the City it is possible, and I imagine the case that there are well over 200 rural consumers.

In the Appendix D covering gas-filled cables there is a reference to $\cdot 7$ of a penny as being the cost per unit. I would like the Author to explain whether that is the overall cost, and, in doing so, if he could let us know the breakdown of the costs in unit related, demand related, and consumer related costs. If $\cdot 7$ covers the lot then it is of course very good. But if it is only the unit related cost, then I come to the point that other Speakers have made that at $\cdot 55$ it is being given away at an unduly low rate.

There are some interesting figures and curves under the Generation Section, the effects of rate of growth of demand on generation costs, and these percentages shown as to when it is time and how much more plant should be put on order. I was interested because, applying Mr. Lynch's formula, it is clear that Port Elizabeth now needs to put on order about 50% of its existing generating plant, and most of it hasn't got the Maker's labels off it yet, it is so new.

I was going to ask about Ruths accumulators, but they have been covered.

On the subject of a more economical type of local reticulation and the use of aluminium conductors, the Author refers to the possibilities of a span between poles being of the order of 200 ft. I am rather wondering whether that is of much use if this reticulation is in the peri-urban areas, because 200 ft. is rather an awkward spacing of poles if you are going to put in street lighting at a later date. It either means a lamp on every pole, which is still a little bit uneconomical or unsuitable, or every other pole, which is certainly too far apart. So that for that reason, and the cost of services to individual houses, I doubt whether there is any gain to be had out of being able to space your poles at 200 ft.

On the question of gas-filled cable I would like to know if the Author can give us any indication as to the cost of maintenance of the gas pressure and the equipment, not a description of the equipment,

but whether that is any drain on the costs of the Department's running.

On the subject of substations in private places, I have had some experience on that and could not agree more heartily with the Author in his explanation of the difficulties which are arising. One suggestion that I feel would be worth consideration and I would like the Author's views, is whether even two cables should go out from that substation without a rental being paid for them. The Supply Authority must retain the right to put in its ring main in and out-going, but any other cable going out to feed anybody else could surely be covered by a rental to the owner of the building because it is a valuable part of the building, in most cases it occupies just as much room as he could get as a garage space. As I said before, Mr. President, the paper is full of meat and I am afraid I am turning it over as you did on the Barbecue last night.

On the use of ripple control I would like to make this comment that there is a sport well-known among us that is called "chasing the peak", and any tariff designed simply to encourage or discourage peaks at certain times of the day is bound to create trouble at some other time. For that alone I think the use of this ripple control or other form of control has very distinct advantages, and the Authorities in the provinces are inclined to feel that every set-up of tariffs should have a special off-peak rate. Unless that rate is so set and so laid down in regard to the times of application that those times can be varied by the supply authority by due notice in the Press, and perhaps a resolution by the Council, the off-peak tariff can create an embarrassment.

On Native housing I wonder if the Author would be good enough to give some details of the type and design of boxes used at the end of the building as shown in the illustration, whether it is totally enclosed and weather-proof and whether it would be likely to stand up to the rigours of a seaside town? I don't say that he could suggest that it would, but it is a question of knowing the material used, whether it is frequently opened, and whether it is completely whether-proof. Finally, also on Native housing, how are the accounts guaranteed, the meters read, and the fuses

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serviced if this out-door box it not universal? I gather it is not universal in Salisbury, but it nevertheless requires a substantial deposit, I should imagine. Or are the residents of the houses so well controlled that there is no question of getting away with paying last month's account?

On the diagram showing low tension reticulation I hope I am excused by making reference to the neutral being earthed at the substation. On my advance copy of this paper I underlined at the substation, and I still feel that a complete reply to the question of earthing the neutral or the mid-point of an electrode boiler has not quite been settled, in spite of the efforts of our Quizmaster yesterday to get that through. There is a danger if the undertaking has not got a multiple earthing neutral system, any earthing that might occur other than at the substation, as shown in this diagram, might create problems and some embarrassment to the undertaking.

I conclude now with a word of thanks to Mr. Lynch for his most interesting paper, and to assure him that I am one who doesn't feel that the system in Salisbury is encouraging waste. Provided it is not being sold below the unit related cost, the set-up here appears to be just right for developing the publicity value of electricity, which is one of the greatest things we have and it cannot be used for anything but the advancement of a town if it is properly charged for. So thank you, Mr. Lynch, and thank you, Mr. President, for this opportunity. (Applause.)

THE PRESIDENT: Thank you, Mr. Gripper.

We now break for tea.

Refreshment Interval

Convention Resumes

THE PRESIDENT: Will Mr. Jaffray please come to the platform. Before carrying on with the discussion on Mr. Lynch's paper, there is one report that has not been given, it is quite a short one on Rights of Supply, and as Mr. Lombard unfortunately had to leave, I will ask Mr. Jack Downey to read it for him.

RIGHTS OF SUPPLY SUB-COMMITTEE:

Mr. President and Gentlemen,

This Sub-Committee met on several occasions during the past year to consider the best manner of approach to implement the resolution adopted by the Association at its last Convention. Due to the fact that this is a matter of vital concern to municipal electricity undertakings on the Reef, the sub-committee worked in close collaboration with the Rand Association of Municipal Electrical Engineers.

A Memorandum regarding the Right of Supply was prepared by the Sub-Committee and submitted to the Electricity Control Board during September, 1955. A request was also made to the Board to meet the representatives of the A.M.E.U. for the purpose of elaborating on the representations made in the Memorandum.

The Transvaal Municipal Association was furnished with copies of the Memorandum and was requested to support the representations made by the A.M.E.U. to the Electricity Control Board and at its Annual Congress held in Pretoria during September, 1955, this body resolved to support the views of the A.M.E.U. as embodied in the resolution taken at the last Convention and as expressed in the Memorandum prepared by the Sub-Committee and to submit strong representation to the Electricity Control Board in this matter.

It is hoped that the representatives of this Association and of the Transvaal Municipal Association will be given an opportunity to meet the Electricity Control Board in the near future in order to discuss this matter with the Board.

C. LOMBARD,

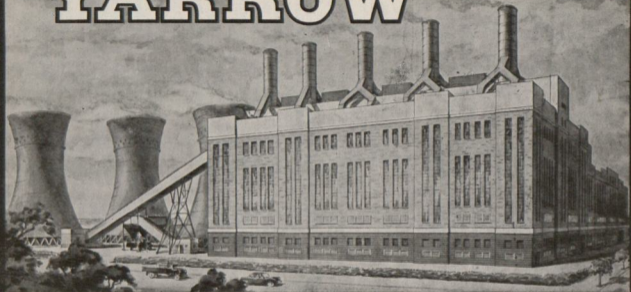
Convenor.

THE PRESIDENT: Thank you, Mr. Downey, on behalf of Mr. Lombard. Are there any comments on that report?

There being no comments, I will now reopen the discussion of Mr. Lynch's paper.

Mr. JACKSON (Cape Provincial Administration): Mr. President, the subject of tariffs is, I understand, a perennial at Conventions. Whilst it isn't strictly a part of Mr. Lynch's paper, it has been mentioned by a number of speakers including Mr. Mathews in commenting on Mr.

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Yodaiken's paper yesterday, when he mentioned a circular issued by the Cape Provincial Administration. I would like to mention, therefore, that because of the difficulties experienced by many local authority undertakings in regularly obtaining a satisfactory balance between revenue and expenditure, the Cape Provincial Administration has favoured and favours the use of tariffs of simple 2-part or 3-part types. Of these types, tariffs based on maximum demand devices and tariffs designed on a room basis are favoured. This doesn't however mean that other tariffs of a similar nature are not necessarily acceptable, but, generally speaking, the Cape Administration doesn't favour tariffs based on the valuation basis or on the sliding scale basis, which is not considered to be of a two-part type.

On the question of off-peak tariffs which has been raised this morning I think that these should be designed and applied with care, but are a useful device in improving a system's load factor and should certainly not be discouraged. Thank you, Mr. President. (Applause.)

THE PRESIDENT: Thank you, Mr. Jackson. Any further contributions?

CONTRIBUTION TO DISCUSSIONS
ON Mr. E. C. LYNCH'S PAPER ON
"SOME ELECTRICAL
DEVELOPMENTS IN THE SALISBURY
AREA"

Submitted by Mr. L. L. BRINKWORTH,
(Johannesburg)

I was very interested in Mr. Lynch's views in Section 3.5 on the use of fire-proof transformers and H.R.C. fusegear in consumer's substations, with the object of avoiding the oil fire hazard. The Class H insulated AN transformer certainly has some advantages compared with the standard ON oil-cooled unit, but I do feel that the case of the air-cooled transformer has been rather overstated.

First of all, it has been assumed that the ON transformer (Table 4 Column A) has no overload capacity. Whilst this may be in line with BSS. 171, it is not invariably true in practice.

In the example given, the period of heavy loading commences at an ambient temperature of 61° F, i.e. at 16° C. As BSS. 171 allows a total oil temperature of 90° C (i.e. a 50° C rise at an ambient temperature of 40° C) this means that an oil rise of 74° C, instead of the usual 50° C, would be permissible and this would dissipate an extra loss corresponding to a continuous overload of 30%. For a short term 2-hour period, the overload capacity of an oil-filled transformer would be even higher than 30%.

Comparing these figures with the Class H insulated AN transformer, British manufacturers normally design for a temperature rise of 150° C by resistance and a maximum hot spot temperature of 220° C, but for short periods this insulation can be taken up to 300° C maximum without harm. Assuming the same ambient of 16° C, this allows a short term temperature rise of 284° C instead of the usual 150° C, giving an overload capacity of approximately 30%, which is much the same as the oil-filled transformer.

Furthermore, if a transformer is to operate at an overload as high as 80%, the copper loss is 3.24 times that at normal load and, as the high temperature will increase the copper resistance by at least 25%, the total copper loss will be 3.24×1.25 , or over four times that at normal load. Since the thermal mass of the coils and coolant is small in an air-cooled transformer, a steady temperature is reached in a matter of minutes rather than hours and I consider an overload of 80%, applied to a transformer designed for Class H temperature rise at normal load will ruin the insulation in a very short time.

Another important factor is that the AN transformer is much noisier than the ON type and this is of particular importance in offices and residential buildings. Reducing the flux density results in a larger core, but as noise is a function of core size as well as flux density, only small reductions in the noise level of AN transformers can be made by this means. It would be interesting to learn of the Author's experience in this respect, taking into account the extra cost of deadening sound.

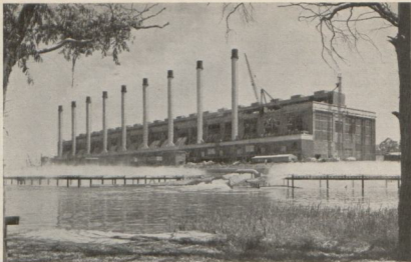


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With an AN transformer it is difficult to obtain a reasonable value of impulse withstand voltage and there is therefore a risk in any situation where voltage surges are to be expected. No difficulty is experienced in meeting 95-kV. for standard 11-kV. oil-immersed windings, but for air-cooled windings I think that 50-60-kV. is about the maximum value that can be obtained economically.

Lastly, I cannot believe that maintenance of an air-cooled transformer would be less than for the ON type. The passage of cooling air deposits dust and sometimes fluff, especially in the cooling ducts between windings, and this restricts the free flow of cooling air. The windings have therefore to be cleaned periodically. On large air-cooled transformers, this effect has been sufficient to warrant the added complication of forced air cooling on the closed circuit principle with a separate heat exchanger. Another point to bear in mind, is the possibility of having to dry out an 11-kV. air-cooled transformer before commissioning.

Before the last war, there was a scare on some of the gold mines on the Witwatersrand due to the danger of transformer oil fires and the effect of fumes from burning oil asphyxiating persons in underground workings. A few non-inflammable fluid filled transformers were installed, but this idea was afterwards abandoned on the score of cost and also due to phosgene and chlorine fumes which were produced following an explosion. Air-cooled Class B insulated transformers were then tried, but these also presented a problem due to the difficulty of screening, not only to prevent rodents getting into the windings, but also to exclude small vermin, such as cockroach, which were attracted by the warmth of the windings and nested, restricting the free flow of air. The use of a fine mesh screen also obstructed proper ventilation, especially as the screen itself tended to collect dirt and block in the course of time.

As a result, I feel that engineers should endeavour to convince the insurance authorities that the standard oil-filled transformer is one of the most reliable pieces of electrical equipment and, if protected by a gas-actuated "Buchholz"

type of relay which can almost anticipate an internal fault, the possibility of an oil fire is extremely remote.

CONTRIBUTION TO DISCUSSIONS
ON Mr. E. C. LYNCH'S PAPER ON
"SOME ELECTRICAL
DEVELOPMENTS IN THE SALISBURY
AREA".

Submitted by Mr. P. A. GILES,
(East London).

Mr. President, I wish to congratulate the Author on the excellence of his paper which I have read with interest and appreciation.

I gather from Table No. 2 that the time required to design, construct and put to work Salisbury No. 3 Power Station has been approximately four years. To complete the entire plant may well take ten years, so that the original design and layout can be 14 years old before the last machine is generating. It seems to me that the Author is aware of these factors and that the designers of the station know how difficult it will be to introduce innovations over so long a construction period. The heat cycles and steam conditions initially chosen will dominate the design and set a limit to subsequent change. Every power station is essentially different from others in certain respects and so every power station designer must build anew to meet the local and external conditions at the time. Whilst he may benefit from the experience of others he can ill afford to copy what has gone before or his design will be out of date before it is well begun. Once completed the power station is a composite machine which will diminish in generation of electricity as obsolescence approaches. The difficulty is to construct an economic frame of reference and for this reason I would have liked the Author to enlarge and develop his theme on the economics of the establishment of the station and the link up with Kariba to cover this point.

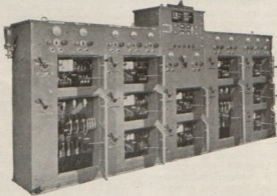
There are two points in the paper of common interest to East London and Salisbury.

The first is the radio-telephone installation and the second is the Ripply control for hot water supplies.

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The important feature which emerges from the use of the communication sets is the speed of action made possible. The faultmen are in continual contact with control and the possibility of errors in switching and transfer of loads has diminished. The arrival time for the attendance on a fault has decreased from an average of 25 minutes to 10 minutes and this has lessened the strain on the system especially if a sub-station switch opens in a domestic area on fault and is closed before the stove switches are moved round to the high position.

An interesting application of the radio telephone recently was the switching on of the Beach illuminations at East London. These illuminations stretch along the Marine Parade from the Orient to the Eastern Beach, a distance of one mile, and three sub-stations furnish the supply.

At the switch-on ceremony which took place at the Orient Beach end three operators were stationed at the sub-stations and given a running description of the event. At the moment the local switch at the Orient Beach was ceremoniously closed, the operators closed the other three switches. The effect was immediate and colourful and the use of temporary control or telegraph wires and relays was avoided. The time for routine switching in the country districts has been reduced from one and one half hours to 45 minutes which is a considerable saving.

The Ripplay injection equipment was installed in East London in 1953 at a cost of £7,700 and injects a low voltage ripple at a frequency of 575 cycles per second into the high voltage network. Delivery of relays has been tardy and to date only 910 relays of the thermol and motor type have been fitted on consumer's premises to control the hot water supplies and to switch off at peak-times. The peak occurs in the forenoon between 11.30 a.m. and 12 noon.

There are 3,237 hot water installations connected to the mains of which 2,633 are 500-watt elements. The hot water elements connected to relays at the moment are mostly 600-watts and over and the throw-off at peak is 800 kVA. This figure will increase as more relays are installed on consumers' premises and represents a significant saving in bulk supply costs besides easing the loading on the distribution system at peak. No tariff inducements or concessions are afforded consumers in East London whose hot water supplies are cut off at peak times or in an emergency.

Under the Standard Electricity Supply Regulations in force the Council has the right to enter the premises to instal the control apparatus and equipment and to utilise the control to switch off electrically operated thermal storage water heaters without liability for loss or damage. The effect of the regulation is to improve the overall load factor of supply to domestic consumers resulting eventually in a reduction in the prices charged for this class of supply. The need for improvement in load factor is evident when it is considered that the calculated load factor over twenty-four hours of an electric stove in use for four hours a day is 17% (seventeen per cent).

Thank you, Mr. President.

Mr. MILTON (Johannesburg): Mr. President, this is most unusual, but I hope you will forgive me but what I should have mentioned on the subject of off-peak tariffs is that we have had an off-peak tariff which we took over from municipal use many years ago. There is not a solitary consumer availing himself of the off-peak tariff, although it is an extremely favourable one. We have since abandoned the tariff and applied to the Control Board for a revision of tariffs.

THE PRESIDENT: Thank you, Mr. Milton. Any further contributions? In that case, I will ask Mr. Lynch to make any reply which he is able to do at this moment.

Mr. LYNCH (Salisbury): Mr. President, Ladies and Gentlemen, I feel very gratified at the reception this paper has received, and also the very considerable discussion which has ensued that has enormously increased the value such a paper might have. I feel rather like starting off with the words of the popular comedian that I have only got four minutes. I do realise how busy this Convention is, but I would like to be allowed to reply to the questions raised by the proposer and seconder of the vote of thanks. The other matters I would like to deal with in writing subsequently.

Mr. Downie raised the question of the disposal of the waste product from the pulverised fuel fire boilers which we propose to instal. I admit that this is, or can be, a very difficult problem, but there has been quite a lot of research and progress of recent years into the manner in which such flue dust can be disposed of.

The Central Electricity Authority in Britain has done some experiments by incorporating a large proportion of PF dust in clay for brickmaking, and I understand that those experiments have been very successful in that the waste product has been economically disposed of. It is even claimed that the quality of the burned bricks produced is better. Now the quality of bricks in Salisbury is not very good, and that may be one outlet which we must investigate when the materials are available in bulk. Of course we haven't ignored the possibility that it will be impossible to dispose of all the material for economic use, and disposal of very large quantities of the material is quite possible in disused clay pits situated about a mile from the station. The material would then have to be moved in large closed road vehicles to the sites for disposal. But that, I hope, will not be a very large proportion of the total.

Now to consider other uses: it is known that pulverised fuel dust is a very useful commodity for mixing in bulk concrete. I am not a civil engineer and cannot tell you all the advantages it has, but I think it

improves the workability of the mass concrete, and when the volumes are very large it has the advantage of keeping the amount of heating of the concrete over the period subsequent to setting to a lower figure. With that end in view some of the large contractors who are interested in the construction of the Kariba Dam have already made approaches concerning the availability of this material for use at Kariba.

You may know that pulverised fuel dust from the London power stations is being shipped as far as the Near East for use in large mass concrete structures. Another possibility might be the production of light weight concrete blocks for housing. If such can be used for Native housing they might well be made by Council, and that is a further possible outlet which we would like to go into when the opportunity comes.

The second question which comes to mind was about reinforced concrete poles used near the road side: are they a source of danger if struck by vehicles? As I have explained, most of our poles are situated on plot boundaries, but nevertheless there are many poles particularly the larger ones carrying high voltage lines, which are in road reserves and naturally from time to time these are struck by road vehicles, sometimes slightly and sometimes very heavily. When the blow is heavy the pole has collapsed completely, but the amount of reinforcing steel in these poles is very large as a proportion of the cross-section, and so the collapse is quite slow. The steel in bending arrests the fall, and there have been no serious accidents as a result of this, so I don't think the risk is large, and certainly not such as to preclude this economical form of construction.

Passing then to the points raised by Mr. Van der Walt, the first one was: Whether it would not be more economical to instal our low tension distribution along a road frontage of the plots and so be able to use the same poles for street lighting? I think the answer must be, yes, it would be cheaper. But if you will only look at some of these installations where that policy has been adopted and see how unsightly it very often is with transformers strung up the poles in front of the house and

numerous wires and so on, you must admit there is certainly no increase in the beauty of the place. We are very proud of this City so far as its trees and flowering shrubs are concerned and you will notice that many of our principal roads are lined with trees and are very wide. When that is so you cannot use the low tension distribution poles for street lighting. In addition in our desire to put the poles out of sight, we have generally erected the low tension distribution at the back of the stands, in sanitary lanes in the earlier parts of the City, but later on, where sanitary lanes have been abandoned in the interest of space, in servitudes granted for the erection of low tension distribution along stand boundaries. I think that is all I have to say on that particular point.

The next point Mr. Van der Walt raised was : why, in the table of costs of construction has the labour cost risen very markedly when aluminium conductor has been used in the experimental installation illustrated. The figures given are for copper £125 for 450 yd. lengths of distributor, and £150 in the case of aluminium construction. There are three major reasons why that has happened. The first is that the aluminium conductor is not nearly as strong as copper, and it has to be handled very much more carefully. The suppliers stress the importance of not nicking or damaging the surface in any way, and for this reason wooden cased pulley blocks have to be used and much greater care to avoid damaging the material. That has tended to slow down the job. The second point is that it is an experimental installation and so has proved dearer than routine procedure. The men are not so used to handling the materials, and the job is not being carried out on such a large scale. The third reason, and I think the most important, is the fact that the aluminium conductor has shown a marked tendency to increase in sag with time and it has very often been necessary to go back to the job a day or so later and re-sag the service into the house. You will appreciate that that must be reflected in the labour costs.

The last question I would like to deal with was concerning the low tension distributors which have been used in the

Native township where individual services could be provided in the future. Remember that this is not done today. We have laid out the system so that at some later date we can easily add an individual service cut-out and a meter if we consider that it is justified. Standard low tension distribution as illustrated in Figure 6 of the paper with copper conductors has been used. There is no difference, it is just the same as in a European township, and has, of course, the same load carrying capacity. The conductor sizes are given, and I must admit that that piece of distribution network is capable of carrying considerably more load than it does at present. In fact probably 30% of the houses (there are about 1,000 of them) could be fitted with cut-outs and metering installations without reinforcing the system other than increasing the transformer size in the substation and possibly other very minor work at the substation. If more than this number of consumers decided to go over to individual metering it would be necessary to reinforce the system, I think this would not be very expensive because, as I pointed out, the houses are built very close together so that distribution is relatively cheap. We could make an economic case of it right from the word go as long as we can see a revenue of £1 or 25/- a month per consumer for about 200 units.

Well, Gentlemen, I think that is all that I can say in answer to the questions. I will endeavour to deal more fully with what has been said in writing as soon as possible, but one thing has rather struck home and that is the number of people that have accused us of waste, encouraging waste in fact!

This domestic tariff that I have quoted was a fully economic tariff when it was initiated just over three years ago. Rising costs have narrowed that margin today, it may even be uneconomical in certain cases, but I don't think that we can be accused of encouraging waste by that tariff. Before we start accusing consumers of waste, and whilst I would be the last one to suggest that there is not any waste taking place on any of these tariffs, we should look to our own shop. These people who are criticising the consumers could well examine their figures for units

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generated at the power station compared with units sold, and they might find that there is about 15 or 20% waste going on there, they might also look at the number of BTU's they buy, and the BTU equivalent of the electricity they sell, and I think that will indicate there is plenty of waste going on in our own organisations and probably less than is taking place in the ordinary domestic home. There is scope for improvement I am quite sure there.

Gentlemen, that really must be all and I would like to thank you very much indeed for the way you have heard my paper and responded to it. (Applause.)

COMMUNICATED REPLY TO
DISCUSSION ON PAPER "SOME
ELECTRICAL DEVELOPMENTS IN
THE SALISBURY AREA"

by

Mr. E. C. LYNCH (Salisbury)

After having been able to reply to the questions raised by Messrs C. G. Downie and J. L. van der Walt at the Convention, it is now my pleasure to answer in writing the further questions which have been raised by other contributors to the discussion. It will probably be most convenient if the questions relate to the various sections of the paper dealing respectively with the Generation, Distribution, and Consumers' Sections of the Electricity Department, are answered together and this procedure has been adopted.

GENERATION SECTION

Pulverised Fuel Fired Boiler Plant.

Mr. Gripper enquires whether pulverised fuel fired boiler plant has any particular features which render this type of steam generator more suited to the outdoor type of construction than the stoker fired unit. An examination of a schedule of recently constructed power stations with outdoor or semi-outdoor coal fired boiler plant certainly reveals that pulverised fuel firing has been adopted in nearly every case, but I feel that this has been occasioned by a general recognition of the advantages to be derived from this type of firing equipment on large power station boilers. The same trend away from the use of chain grate

stokers can be observed in plants where fully enclosed boilers are used, particularly where high evaporative capacities in single units are required. When tenders were invited for the supply of the Boiler Plant for the Salisbury No. 3 Power Station, manufacturers were prepared to offer stoker or pulverised fuel fired boilers of semi-outdoor construction and, as indicated in the paper, the price was hardly affected by the type of firing adopted. It can, therefore, be concluded that the method of firing to be used need have no bearing on the type of enclosure for the boiler.

Generation Costs

The cost per unit given in Appendix D as 0.7 pence is the total cost of production per unit sent out from the power station. For the financial year ended 30th June, 1955, the breakdown of the cost was as follows:

	Pence per unit sent out
Coal and Water	0.358
Interest and Redemption	0.182
Salaries and Wages	0.108
Other costs	0.046
Total	0.694

These figures relate to an output of 145,178,000 units and a maximum demand of 61,000 kW, sent out during the year. The equivalent fixed and variably components of the costs of production are therefore about 100.5 shillings/kW, of maximum demand per annum and 0.394 pence per unit respectively. It will be seen that the sale of electricity to domestic consumers and for certain purposes at 0.55 pence per unit can be fully economic provided the load is kept off the annual peak. However, the annual fixed component of the cost per kW, of demand is subject to considerable variations from year to year due, in particular, to such factors as the incidence of unusually cold weather in June (which by raising the maximum demand for the financial year will decrease the apparent fixed cost per kW,) or the date upon which large blocks of capital expenditure are brought to account following the commissioning of new plant. For this reason the

more stable figure for the total production cost of power sent out from the power station has been used to assess the cost of losses in the gas pressure cable.

Economics of Plant Operation

Mr. P. A. Giles' enquiry concerning the frame of reference adopted in order to establish the economic factors associated with the future operation of the Salisbury No. 3 Power Station in parallel with the Kariba interconnected system raises a problem of some difficulty. At the time when decisions had to be made concerning the design characteristics of this plant, the Government had made no final decision upon the construction of any large hydro-power plant, and, owing to the anticipated very high costs of the initial stages of both the Kariba and Kafue projects, it was by no means certain that the necessary capital funds would be available for a start to be made on any such scheme in the immediate future. The prime requirement was for additional generating plant to carry the Salisbury load in 1957 and immediately thereafter, independent of any other source of supply. The plant was designed in the light of these requirements, but, at the same time, the possibility of operation in parallel with a large interconnected system having a preponderance of hydro-power with a very low energy related cost could not be ignored. The advantages of thermal plant having low standby losses, quick starting and rapid loading characteristics, already attractive by reason of the wide daily variations in the Salisbury system load, were conclusive.

Any assessment of the economic advantages to be derived from these operating characteristics requires a fairly complete knowledge of the manner in which the thermal plants are to be loaded after interconnection with Kariba; and difficulties may be experienced, particularly during the years immediately following the commissioning of large blocks of hydro-plant, when a large overall surplus of generating plant will exist within the Federal area. Economic considerations will then indicate that most of the thermal plant should be shut down, and that required for marginal or standby use must be operated at the lowest practicable load factors in order to obtain the least overall

cost of operation. Then, as load growth takes up the surplus generating capacity, this thermal plant must be brought back into operation stage by stage until another large increase in hydro-power capacity can be justified. This loading cycle can then be expected to be repeated over periods of perhaps 5 to 10 years. But one may well ask what arrangements are to be made for the staffing of a power station which may be required to operate for a few weeks in the winter of perhaps two years in every seven? Clearly the operating staff in such stations cannot be dispersed and recruited at each incidence of load, neither can they be sustained in idleness for perhaps five years in seven. Some long term loading programme which will make reasonable use of those thermal stations selected for future interconnected operation, must be laid down well in advance of the commissioning of the hydro-plant, and this programme should aim to give the optimum economic cost of operation for the interconnected system over a period of years. This problem has been examined in some detail in a recent paper by Messrs. Haldane and Blackstone "Problems of Hydro-Electric Design in Mixed Thermal-Hydro Electric Systems" (Proceedings I.E.E. Part A June, 1955.)

DISTRIBUTION SECTION

Distribution Costs

The figures given by Mr. Sibson for the distribution costs per million units sold per annum are of interest and certainly show a surprising variation as between the various undertakings mentioned. In order to examine more closely the import of these figures, Tables A and B have been prepared from the South African Municipal Year Books for 1954/55 and 1955/56 respectively. It was expected that the figures given under item (k) would agree with those quoted, but whilst conformity is reasonably close in Table A for Port Elizabeth, Durban, Cape Town, Bloemfontein, East London, and Salisbury, considerable differences are noted for Johannesburg, Pretoria, and in particular for Bulawayo where a figure of £5,436 per million units sold per annum appears, as against £10,000 given during the discussion. However, from Table B, it would

TABLE "A"

ITEM	"Electric Light and Power" Tables Section IX. South African Municipal Year Book 1954/55								
	Port Elizabeth (y.e. Dec. 53)	Durban (y.e. July 54)	Cape Town (y.e. Dec. 53)	Bloemfontein (y.e. March 54)	Bulawayo (y.e. June 54)	Johannesburg (y.e. June 54)	Pretoria (y.e. June 54)	East London (y.e. Dec. 53)	Salisbury (y.e. June 54)
(a) Units sold (Total) — — — kWh. × 10 ⁶	261-896	612-137	602-300	90-782	224-999	1,064-291	723-792	89-544	227-234
(b) " " (to other suppliers) — — —	50-966	2-182	—	—	65-012	158-763	234-864	—	46-722
(c) " " (bulk and H.T.) — — —	94-760	109-492	99-910	32-219	50-725	—	235-633	—	22-660
(d) " " (other consumers) — — —	116-170	500-523	502-389	58-563	109-262	—	253-295	89-544	157-852
(e) Annual Maximum Load — — — mWs.	63-1	153-0	159-0	28-2	59-2	293-4	150-8	—	59-9
(f) Annual Load Factor — — — %	47-4	45-0	43-2	36-8	42-4	41-4	54-8	—	43-3
(g) Number of consumers (bulk and H.T.)	105	32	108	46	26	1,321	85	—	23
(h) " " " (other) — — —	25,409	69,344	82,465	9,114	12,923	78,536	42,601	12,221	15,605
(i) Original Cost of Distribution Plant in service £ × 10 ⁶	1-625	5-118	5-280	0-834	1-223	9-483	6-143	1-185	3-974
(j) Original Cost of Distribution Plant in service per million units sold per annum — — — £	6-205	8-360	8-766	9-187	5-436	8-910	8-487	13-233	17-489

TABLE "B"—Section X—1955/56

	y.e. 1954	y.e. 1955	y.e. 1954	y.e. 1955	y.e. 1955	y.e. 1955	y.e. 1955	y.e. 1954	y.e. 1955
(a) Units sold (Total) — — — kWh. × 10 ⁶	293-728	666-833	647-494	97-138	233-619	1,149-963	765-052	95-857	226-421
(b) " " (to other suppliers) — — —	57-402	—	—	—	70-591	164-998	227-036	—	22-524
(c) " " (bulk and H.T.) — — —	116-730	151-980	113-521	35-016	65-575	—	289-711	—	26-553
(d) " " (other consumers) — — —	119-596	514-852	533-942	62-121	97-453	—	271-305	95-857	177-344
(e) Annual Maximum Load — — — mWs.	71-0	153-0	165-5	30-0	57-5	217-3	151-9	—	61-0
(f) Annual Load Factor — — — %	47-3	50-0	44-7	36-3	46-4	41-4	57-5	—	42-2
(g) Number of consumers (bulk and H.T.)	107	33	116	46	32	1,407	87	—	24
(h) " " " (other) — — —	26,240	70,961	84,864	9,737	13,368	80,030	45,976	12,745	17,225
(i) Original Cost of Distribution Plant in service £ × 10 ⁶	1-625	5-118	5-899	0-939	2-244	10-780	6-670	1-363	4-548
(j) Original Cost of Distribution Plant in service per million units sold per annum — — — £	5-532	7-675	9-111	0-667	9-605	9-374	8-718	14-219	20-086



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appear that for the City of Bulawayo the original cost of distribution plant has risen to £2,244,000—an increase of £1,021,000 or 83·5% in the single financial year ended June, 1955—so that the distribution expenditure per annum rises to £9,605 which practically eliminates this particular discrepancy.

An examination of these figures in Tables A and B (item k) p. 249, reveals even wider differences than those quoted by Mr. Sibson, so that I am led to doubt whether, in the absence of either precise definitions of the distribution costs given in the tables of the Municipal Year Books, or the acceptance of common methods of accountancy as between one municipal undertaking and another, the figures quoted give any true indication of the relative efficiencies of the distribution undertakings listed. For example, one undertaking may deem that the "Original cost of distribution plant in service" shall include only plant such as transformers, switchgear, and substation equipment excluding the costs of overhead lines, underground cables, services and buildings while another may include all such items, as in the procedure adopted in Salisbury. It is also surprising to find that some Undertakings with quite a high rate of growth of load—e.g. Port Elizabeth and Durban—are listed as having incurred no capital expenditure on distribution during the last financial year, since there has been no increase in the "Original cost of Distribution plant in service" over this period.

It must also be pointed out that the original cost of the distribution plant in service per million units sold per annum is no true criterion of distribution costs as between one supply authority and another since it completely disregards the following factors which must have an important bearing upon the distribution costs of a particular undertaking:

1. The comparative magnitude of the distribution systems as determined by the peak load capacity and total units sold per annum;
2. The proportion of units sold in bulk to very large consumers and other supply authorities;

3. The number of consumers supplied from the distribution system and the average consumption per consumer;
4. The area of supply covered by the distribution system and the mean load density therein;
5. The rate of growth of load within the area of supply.

An examination of the information given in Tables A and B gives some guidance on the range of these major cost related variables in the undertakings cited. For example it can be seen that Johannesburg sells twelve times the number of units each year as does East London, while Pretoria sells over 64·5% of its output in bulk to large consumers and other supply authorities. The Pretoria distribution system covers about 1,500 square miles and Port Elizabeth's only just over 100 square miles. The increase in units sold, including sales in bulk to other supply authorities, ranges from 13% in Salisbury to 2% in Bulawayo. Any valid criterion of distribution costs must include all of these variables and is clearly a matter of considerable complexity. The subject is considered in detail in a recent paper by Mr. D. J. Bolton to which those interested may be referred*.

Mr. Fainsinger feels that more economical forms of overhead line construction would be possible by the use of creosote impregnated gum poles in place of the reinforced concrete poles now adopted as standard throughout the Department's area of supply. Selected straight gum pole timber, suitable for overhead line supports is by no means cheap or plentiful in the Salisbury area, and the Department is satisfied that, once having established facilities for the economical production of reinforced concrete poles, the advantages of this form of construction—particularly with regard to permanence, low maintenance costs, and freedom from fire damage—are such that no change to the use of timber supports can be justified.

In answer to Mr. Murray Nobbs' enquiry concerning the method adopted in financing electricity distribution in private townships situated within Council's licensed area of

*"A Criterion of Distribution Cost" Proceedings I.E.E. Part A, August, 1955

supply, I have to advise that at present no capital charges or revenue guarantees are required from the estate developers—all such costs being met from the Department's annual loan allocations. However, since the widespread scale upon which such development is now taking place is making excessive demands upon the Council's severely restricted capital resources, the introduction of some such payments may become necessary in order to encourage land developers to follow a more orderly course in opening up new areas rather than in any desire to hold back the overall rate of development.

Distribution Planning

Adverting to the paper concerning the development of the Salisbury Municipal Electricity Undertaking read by Mr. J. S. Clinton at the 1945 Convention, Mr. Gripper enquires whether the method of pre-planning distribution systems in hexagonal areas, as then described, is still adopted. Two major changes have taken place in the development of the Salisbury undertaking which could not have been foreseen at that time. Firstly, the area of supply, then comprising approximately 2,700 square miles of sparsely developed country, has been reduced to 580 square miles—within which area intensive development is proceeding. Secondly, the rate of increase of population has been far greater than was anticipated.

The basis of development then foreseen was that of a large farming area including a considerable mining load and centred upon a relatively small town. It is not surprising to find that the method advocated for pre-planning the distribution system is quite inapplicable to the area of supply as now described and the system has, of necessity, been abandoned.

Use of Gas Filled 33 kV. Cable

With regard to Mr. Gripper's enquiry concerning the maintenance costs of gas-filled E.H.T. cables, I must point out that the cable described in the paper has now been in service for only a few weeks and so it is not possible to give any figures for the cost of maintenance. No trouble whatsoever has been experienced since the date

of commissioning, and there would appear to be no reason to suppose that the cost of repairs or maintenance on this type of cable should be materially different from the costs incurred on alternative types of high voltage cable. In fact, there are reasons to suppose that the costs of effecting repairs to such cables following superficial damage to the sheath may be substantially less than with the solid type cable. It has been the unfortunate experience of the Department that persons carrying out excavations along cable routes may inflict damage to the cable to the extent of puncturing the lead sheath without the fact being drawn to the attention of the supply authority. The excavations are filled in, and it may be many months or even years before breakdown of the cable occurs—by which time a very considerable length of cable may have been rendered useless by moisture penetration. Two joints and the replacement of a short length of cable will then be necessary and the entire cost of repairs may have to be borne by the Department, as proof of the responsibility for the original damage may by then be impossible to establish. Similar damage to a gas-filled cable would be detected at a very early date—probably before the excavations had been filled in—by the operation of the gas leakage alarms. Those responsible for the damage can be indentified and charged with the cost of repairs whilst secondary damage to the cable by breakdown or moisture penetration may well be avoided.

Substation Requirements in Commercial and Flat Development Areas.

Most of the contributions to the discussion would appear to agree with the views put forward regarding the provision of substation buildings by large consumers in high load density areas, and the particulars given of the approach to the problem adopted by other supply authorities has added much of value.

Mr. Gripper feels that rent should be paid, to the owners of substation buildings in respect of outgoing feeders which are used to supply other consumers. However just this proposal may seem, there are in practice serious objections, in that the cost of administration of any such scheme would be very large compared with any

reasonable rental payments which would be advocated. Such rental should be assessed by reference to the extra substation building space required over and above that which would have been needed had no such extra outgoing feeders been required. In general no such extra space is called for, and so the payment of a rental could not be justified.

Use of Fire-Proof Transformers in Consumers' Substations

Mr. Lombard raises a number of questions concerning the economic justification of the use of Class B and Class H insulated fire-proof transformers in consumers' substations. In this connection it is of interest to note that, since the paper was written, manufacturers have been able to offer very considerable reductions in the price of Class H insulated distribution transformers. For example, recent tenders have shown that the price of a 300 kVA transformer has now fallen to £735 delivered Salisbury, as compared with the price of £1,134 for an equivalent transformer given in Table No. 4. Similarly reduced prices are offered for the larger sized units, so that the economic incentive for the use of this type of distribution transformer in consumers' substations where fire risks must be reduced to the minimum, has been greatly increased. Standard transformers filled with non-inflammable liquids, as mentioned by Mr. Lombard, would certainly be considerably more expensive due to the high price of suitable cooling mediums.

The major difficulty in the use of fire-proof guillotine doors automatically operated from fusable links and arranged to close all ventilation openings in transformer cubicles incorporated in large commercial buildings, as advocated by Mr. Lombard, is the loss of open wall area which is needed for the adequate cooling of the plant enclosed. The plan of the typical consumer's substation building (Fig. 10) shows all three sides of the transformer enclosure fully utilised for louvred ventilators and this is the preferred arrangement. If quillotine doors were to be used over these openings, a larger enclosure would be necessary in order to provide the same

area of open space for the louvred ventilators. In such buildings as are now under consideration, space is at a premium, and the Department's requirements have been kept to an absolute minimum.

Mr. Lombard questions the statement in Section 3.5 of the paper to the effect that both the lowest capital charges and least running costs can be achieved when these fire-proof transformers are used. This statement is based upon the assumption that the alternatives are either :

1. an air-cooled fire-proof transformer in a standard consumer's substation as described in the paper, or
2. an oil cooled transformer installed in such an enclosure but with the provision of automatic fire extinguishing apparatus to meet the requirements of public fire prevention authorities. In his comparative cost calculations, Mr. Lombard has not included the expenditure necessary for the installation and maintenance of this apparatus, and so is led to disagree with the above statement.

Both Mr. Milton and Mr. Brinkworth point out that difficulties may be experienced with the maintenance of these air-cooled transformers and anticipate troubles due to the cooling passages becoming choked with dust. The final answer to this problem can be given only after these units have been in service for a number of years, but unfortunately, the Department's experience in this respect is very limited as none has been in service for longer than twelve months. Information as is at present available indicates that the type of transformer now in use could be cleaned quite adequately by means of compressed air; but how often this will prove to be necessary has yet to be determined. To date, no maintenance costs have been incurred on any of the units installed. Mr. Brinkworth states that the air-cooled type of transformer is much noisier than the standard oil immersed unit and enquires whether any additional costs have been necessary to reduce this noise to an acceptable level. No significant difference in the noise level produced by these two types of transformer has been noticed and with eighteen air-cooled transformers

installed in consumers' substations—both in large commercial buildings and blocks of flats—the Department has yet to receive a complaint of excessive noise from one of these units. In no case has any special precaution been taken to reduce the noise emanating from the substations.

CONSUMERS' SECTION

Consumers' connections and tariff for supply

Mr. Milton asks for particulars of the connection fees payable by consumers supplied from the low tension distribution system. Within the municipal area the following fees are payable :

Single Phase Overhead, £4.

Three Phase Overhead, £8.

Single Phase Underground, £6 plus 3/- per foot length of cable over 30ft.

Three Phase Underground, £10 plus 4/- per foot length of cable over 30ft.

Within the Council's licensed area of supply but outside the municipal area, variable connection fees are payable dependent upon the distance of the consumer's premises from the power station. For convenience this distance is measured from the survey beacon sited on the top of the Salisbury Kopje and the fees are as follows :

Single Phase Overhead, £5 per mile.

Three Phase Overhead, £7 per mile.

Single Phase Underground, £5 per mile plus 3/- per foot length of cable over 30ft.

Three Phase Underground, £7 per mile plus 4/- per foot length of cable over 30ft.

A consumer requiring one connection with a number of services therefrom, as for example a block of flats, is required to pay a single connection fee, but a charge of £5 is payable for each additional metered supply.

In reply to Mr. Lombard's question concerning electricity services in blocks of flats, I would explain that for the purpose of determining the number of consumers

connected, each metered supply to a flat is counted as one service and in addition the flat owner will probably require one further meter service to provide vestibule lighting and possibly another for power for the lifts where such are installed.

In answer to Mr. Gripper's enquiry, the number of rural consumers taking supply from Council's mains for agricultural purposes is now 107 and the average annual consumption is approximately 18,000 units per consumer.

Mr. Turner asks for further information concerning the lower charges for connections and domestic electricity supplies which have been applied to the Mabelreign township because of the orderly development and high density of housing which has been adopted in this township. It should be explained that Mabelreign is outside the Salisbury Municipal area (see Fig 5) and so will be subject to higher connection fees and tariff charges than are applicable to consumers situated within the City limits. In this particular area, and for the reasons stated, the connection fee for a single phase service has been reduced from the normal £25 per house to £20 per house payable by the main building contractor in respect of the construction of a group of houses. Electricity is also made available to the consumer at a cheaper rate since the surcharge of 25% over the municipal tariff which would normally apply in this area has been reduced to 16%.

Electrical Installation : Trafalgar Court

It is not possible to give an answer to Mr. Turner's enquiry concerning the comparative costs of the electrical installation at the Trafalgar Court building had the work been carried out by a private contractor instead of departmentally, as no tenders were invited for this work. The final cost of the work undertaken by the Department in this building was £27,436, or just over 4% of the total cost.

Costs of Consumers' Services

Mr. Lombard questions the figures of £2 and £1 given respectively as the variable components of the costs of three phase and

single phase services in section 4.1 of the paper. These amounts cover only the approximate costs of the four or two service wires, from the distribution mains to the consumers' shackles, as required for the two types of service. The average length of such a service would be about 100 ft. span.

In answer to Mr. Milton, the following average costs to the undertaking of consumers' services are given:

Single phase overhead	£16 15 0
Three phase overhead	£37 1 0
Single phase underground	£39 15 0
Three phase underground	£57 9 0

These costs include all line materials, transport, labour charges, cut-outs, and meters. Cables from the consumers' shackling off point and meter boards are supplied and fixed by the consumer.

Mr. Turner has noticed that the Department no longer uses flying fuses on consumers' service lines, and I can confirm that this practice has been abandoned as with the introduction of insulated service wires, these fuses were found to be unnecessary. A considerable saving in the cost of services is obtained and in addition less calls are made upon the faults department.

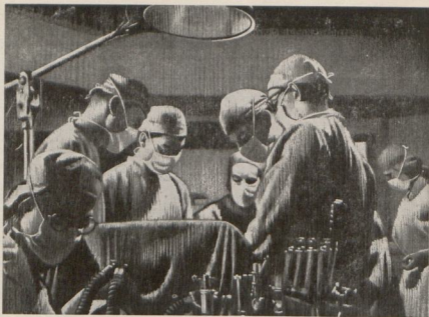
Use of Ripple Control Gear

Mr. Milton enquires why the actual reduction of peak demand brought about by the use of ripple relays is not quoted rather than the estimated figure given in Section 4.3 of the paper. The reason for this is that the full benefits of the installation of this system of remote load control can be obtained only if the system annual load factor is raised to the greatest extent. On the Salisbury system this requires that the control gear must be used to throw off the water heater load over the evening peak periods during cold weather in the months of June, July, and August, so that a direct measurement of the load reduction is not possible. However, mild weather during these months will cause a considerable drop in the evening peak load and at such times the ripple control gear may be kept inoperative, so far as the water heater

control channels are concerned, without affecting the annual peak demand. By comparing the peak loads on successive days, with and without the operation of the water heater control channels, it is possible to determine the amount of load reduction brought about by the use of this control gear. It is assumed that the same load reduction would be brought about by the use of the load control apparatus at the time of the annual peak demand.

The figures given in the paper indicate that each relay will reduce the demand by about 1.2 kW. at the Power Station but it should be mentioned that when similar measurements are taken at individual substations, considerably higher figures for the load shed per relay are obtained. This is due to the similarity in behaviour pattern of residents in a particular locality. It is noticed, for example, that the peak load occurs earlier in the high density housing areas than in the more expensive residential districts, probably due to the greater number of young children causing a relatively larger demand for hot water early in the evening. Meals may also be served earlier in the smaller houses as fewer domestic servants are employed.

Mr. Murray Nobbs mentions the noise emitted from ripple relays installed in consumers' premises and enquires whether this has occasioned difficulties on the Salisbury system. It is agreed that ripple relays give an audible "whine" when operating and it has not been found possible to eliminate this noise. The loudness varies with the magnitude of the ripple voltage used to operate the relay and it has been the experience of the Department that provided this does not exceed 2 volts, consumers do not complain. On the other hand, ripple impulses of less than one volt are liable to cause uncertain operation of the relays so that the supply to the water heaters may not be restored upon transmission of the appropriate signal. It will be appreciated that the design and adjustment of the ripple injection equipment is somewhat critical if the ripple voltage is to fall within these limits on all parts of the low tension distribution network. There are parts of the distribution system in Salisbury where it has been found impracticable to



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maintain the ripple voltage within these limits and ripple relays are not installed in consumers' premises in these areas.

Utilisation of Electricity in Native Townships

The section of the paper dealing with the utilisation of electricity in the Native townships has evinced considerable interest as shown by the discussion. Mr. Gripper asks for further details of the outdoor service box built into the end walls of the house illustrated (Photograph No. 10). The meter and service box to serve a semi-detached pair of houses now comprises a sheet steel cupboard 18" x 18" x 7" deep, fitted with a hinged steel door with a hasp and staple to take a standard padlock.

The cabinet is furnished with one fused cut-out one neutral link, two double pole miniature circuit breakers of the instantaneous overload trip type and, if required for recording purposes two watt-hour meters. All of this equipment is mounted upon a ½" thick tempered hardboard panel supported from angle brackets. For conditions prevailing in Salisbury these service boxes are considered quite suitable but for use in coastal towns it would be preferable to use galvanised sheet steel for the construction of the boxes.

At present, individually metered supplies are not afforded to Native houses and so the problem of guarantees for payments in respect of such supplies does not arise. However, the Department does have a number of Native consumers responsible for payment of their own accounts. These are chiefly Native traders with stores or workshops situated within the Native townships. Each account is guaranteed in the normal manner by the pre-payment of a deposit equivalent to two month's estimated consumption.

In conclusion, I feel that readers may be interested to learn the following results of a recent survey of electrical apparatus in use at the Municipal Native townships of Harari and Donnybrook:

	Harari	Donnybrook
Cookers and Hotplates	1,701	13
Room Heaters	909	2
Irons	4,917	210
Kettles	Nil	32
Radios (Mains)	3,364	168
Refrigerators	164	Nil

The survey was conducted by Council's Native Administration Department with a view to determining the reasons for the increased consumption of electricity in these areas. No attempt was made to prevent the owners from continuing to use the apparatus despite the fact that no charge is levied at present in respect of the additional power consumption. It was felt that had any such discouragement been evident, the results of the survey would have been invalidated by the concealment of much electrical apparatus now in use.

THE PRESIDENT: Your Worship the Mayor, Ladies and Gentlemen, the only thing we have not actually completed was the discussion on the 11,000 volt cable Spec. 480 and I have mentioned the fact to the Mayor that we wanted to carry on with this. With his permission, I am going to throw open that last portion of the Engineers' Forum which was not completed on 11,000 volt cable for further discussion now.

Mr. SUTHERLAND (Pietermaritzburg):

Mr. President, when the discussion on Tuesday afternoon completed, I was left with the firm conviction that quite enough had been said on this subject, but since the matter has been re-opened I think it might be appropriate for at least one voice to be heard from amongst the cable manufacturers.

Mr. Sibson has possibly put his finger on the real trouble by suggesting that 11 kV. cable manufactured to BS 480 has got too much of a reduced safety factor for reliable operation, and that the remedy may be to use cables manufactured to BS 760, or to any other specification with a better factor of safety. But, Mr. President, I think that all the engineers here, whether cable users or cable manufacturers, will agree that that doesn't get to the heart of the problem. As engineers I think that we would be all

interested to know why it is that cable manufactured to BS 480, which apparently gives satisfactory service in the U.K. and I think other parts of the British Commonwealth, apparently can't be construed as reliable in Southern Africa. This, Mr. President, is a subject which is of just as real interest to cable manufacturers as cable users. I submit that it is certainly not a subject in which the solution will be found by prolonged discussion in an open forum such as this, and I would like to suggest that consideration be given to adopting what appears to me to be the only practical way of going about this, which is the formation of a small committee comprised of both cable users and also including a representative of each of the three cable manufacturers in Southern Africa, with instructions to collect and collate all the information on this subject and to report back either to members of this Association, or, should it take long enough, even to the next Convention, with recommendations as to the most satisfactory way of overcoming this problem. Thank you, Mr. President. (Applause.)

THE PRESIDENT: Thank you, Mr. Sutherland. Your suggestions will be taken note of.

Mr. DUNK (Port Elizabeth): Mr. President, His Worship the Mayor, Ladies and Gentlemen, I am another one of these blue-ticket boys which indicates what side of the fence my interest lies. I would largely like to support the previous speaker, Mr. Sutherland, on the question of getting together a panel of engineers, preferably with all the cable makers sitting on this panel, and your Association appointing those engineers who you feel would most ably contribute towards any discussions on the subject. The work which has been undertaken by Mr. Mathews of Kimberley, I think we will all appreciate, has been most ably carried out, and does indicate that the problem is a wide one and a complex one. I think that if this panel could be formed with a view to meeting in some suitable centre, and the whole subject being fully discussed, all symptoms and so on being properly correlated, I think that we may get much more value than by attempting to get down to technicalities in a large

open Forum like this. Thank you, Mr. President. (Applause.)

THE PRESIDENT: Thank you, Mr. Dunk.

Mr. YATES (Vereeniging): Mr. President, His Worship the Mayor, Ladies and Gentlemen, the last two speakers have expressed views as cable manufacturers, and I would like to express a point of view, and also to give a certain amount of information in reply to the questions asked in the Forum yesterday.

I would like to confine my comments to breakdowns which have occurred in 11 kV, belted cables earthed, and unearthed, manufactured to BS 480/42 and to SABS 97 of 1950 both of overseas and local manufacture, in regard to which no satisfactory explanation for failure has yet been advanced. I refer specifically to the failures which on post mortem examination revealed the presence of extensive uncarbonised pin hole formations in the paper insulation in the near neighbourhood of the fault. Although there may have been previous instances of failures showing these characteristics, we first detected their presence in a cable which failed in 1951. Since that time we have examined many breakdowns in 11 kV, belted cable to BS 480/42 both of local and overseas make which have exhibited these characteristics.

These breakdowns appear to be peculiar to Southern African conditions, as we have been informed from reliable sources that the phenomena has not been detected in cables made to the same specification in the United Kingdom. Generally speaking, the following similarities exist in most of the cable faults of this type which have been examined.

Firstly the faults occur in short lengths of cable close to end boxes, some instances of pin hole formation in the insulation of cables which have failed well inside the lengths have been recorded, but breakdowns inside cable runs are very rare in our experience. Furthermore, in those instances in which the puncture phenomena has been detected inside cable lengths, it has not been possible to be specific that they have played any major part in the breakdown as they have been very limited in extent. Secondly, the absence of signs

of tracking and tree burning, and the complete absence or limited extent of waxing of the impregnating compound in the vicinity of the fault.

Thirdly, the absence of carbonisation of the paper except at the actual point of fault and the absence of the characteristic smell that is associated with certain types of paper dielectric deterioration.

Fourthly, the majority of cables exhibiting this puncture phenomena which has been brought to our notice are 3 core cable; in general the standard of paper lapping in these cables has been satisfactory.

The next point, the punctures themselves which vary in size from $\frac{1}{8}$ " in diameter to minute pin holes, and which appear only in the insulant in the region of stress between conductors are coincident from paper to paper. No punctures have yet been detected in the belt insulation or in that part of the core insulation which is in the region of stress between the conductor and the lead sheath. Instances have been examined in cables which have not broken down where there has been an almost continuous path of punctures between conductors. In general, however, they appear to be limited to the inner 5 or 6 core papers reducing in size as their distance from the conductor increases. In many instances the punctures appear to emanate from gap spaces between paper immediately close to the conductor penetrating radially into the insulation, and are apparently independent of the proximity to the edge of the papers in successive layers. There have been instances, however, in which the puncture formations do not appear to emanate from gap spaces, punctures have been found at distances up to 3ft. or more from the fault itself.

Almost invariably the copper strands show a local greenish discolouration in the regions where the pin hole formations appear to emanate, and, where this doesn't coincide with the gap space in the first paper, the pattern of discolouration is coincident with the shape of the hole formed in the first. In most instances it has not been possible to detect any significant amount of moisture in the insulant and lastly the time for breakdown to occur which are associated with this phenomena

varies between the first few months and sometimes years.

Having thus described the characteristics of the fault associated with the uncarbonised punctures, it is interesting to compare these with the three distinct types of breakdowns which have been established by standard techniques of cable testing and cable dissection. The three types are as follows:

Firstly, failure by thermal instability; secondly, discharge or tracking method of breakdown; and thirdly, puncture or disruptive method of breakdown. Thermal instability has been described in various technical literature and in particular by L. G. Brazier in the Institute Journal volume 77. Anyone reading this paper will see immediately the type under present consideration is not of this nature.

The discharge or tracking method of breakdown is described by D. M. Robinson in the same Journal, and here again the characteristic of excess was formation with the formation of carbon tracks is not applicable.

This leaves only puncture mechanism to be considered and this is described by Davis in another Institute Journal, the type of deterioration described fits most closely the facts known in connection with the troubles being experienced in Southern Africa. The exact mechanism by which the cables become subject to such deteriorating influences, as far as we know, and it is considered that this may well form the basis for research work by public organisations who are equipped to deal with this type of investigation before any major modifications to existing specifications are embarked upon. Thank you. (Applause.)

THE PRESIDENT: Thank you, Mr. Yates, I believe there is one more contribution. Well if there are no further contributions to the cause of Spec. 480 11 kV. cable we will now proceed to the various speeches which accompany the closing of a convention of this nature and I will first of all call upon Councillor Jonker of Krugersdorp.

Cr. JONKER (Krugersdorp): Your Worship the Mayor, Mr. President, Ladies and Gentlemen, it is truly a great honour

which befalls me to thank the City Council of Salisbury for their traditional Rhodesian hospitality and the manner in which they entertained us. We could find no room for improvement. I have heard only of one complaint, however, and as usual it comes from our electrical engineers: a short circuit in the cable again. Their complaint is, Sir, that the Executive meeting started at half past eight.

Your Worship, Mr. President, we want to congratulate Salisbury for the impressions you have given us of Salisbury. I will be failing in my duty if I don't mention the coloured fountain in Cecil Square, and your perfect replica of the Victoria Falls in the Gardens. We have to thank you most heartily for all the entertainment arranged on our behalf, I am thinking of all the various visits yesterday as well as the perfect "rooi-nek" braaivleis we had at Cleveland Dam (laughter). The fairylike coloured lights there will not be easily forgotten, I believe a number of us became quite romantic.

We also want to say thank you to all those who assisted in making this Convention such a great success, and in this category I would include the Brains Trust and the Quizmaster, Mr. Downey. Where is he? Thank you, Mr. Downey. Your Worship, Mr. President, you have really made a great success of this Convention, we thank you one and all, we beg of you Your Worship and Mr. President to accept the sincere thanks of this Convention. Now Mr. President we wish you best of health and a very successful year of office, may this Association live up to our expectations. I only hope that Krugersdorp, although away from its home town can do half as well as you have done.

Mnr. die President, ek weet u kan nie Afrikaans verstaan nie, en Agbare Burge-meester, maar ek sal miskien my plig versyn indien ek nie 'n paar woordjies in my eie taal ook sal kan sê nie. Dit verlang ek natuurlik, alleerlik, om te sê, as gevolg van die feit dat ek so trots is op Krugersdorp en daarom is ek trots om Krugersdorp ook hier in Salisbury te verteenwoordig. Wat natuurlik ook die minste die saak vir my so goed en roog plaas nie, is as gevolg na die feit dat ek 'n man soos Mnr. Van der Walt aan my sy kom hê.

U weet meneere, dames, dat Krugersdorp het ook sy trots en ons spook nogal daarmee dat ons die uraam stad van die Unie is, en daarom spog ons nogal in besonder met ons amptenare. Ons glo ons het van die bestes aan die Rand, en daarom het u vir ons ook geerken deur Mnr. Van der Walt as die Onderpresident te aantewys. Baie dankie vir die erkentlikheid daarvoor en nogmaals in Afrikaans baie baie dankie Mnr. die President en Mnr. die Burge-meester.

THE PRESIDENT: Thank you, Cr. Jonker. I think Mr. Van der Walt has something to say on behalf of the Ladies.

Mr. VAN DER WALT (Krugersdorp): Your Worship, Mr. President, Ladies and Gentlemen, I have now also entered the sacred ground of being one of the ladies so you will excuse me if I refer to them as we or us (laughter.)

(Imitates tobacco auctioneer.) Mr. President, I thought I heard the ladies giving their impressions of the tobacco sales they visited. (Laughter.) Mr. President, I would like to refer to a story about a little immigrant into the Rhodesias. You know, of course, we ladies have a very great interest in the movements of our husbands, we can either make or break them, we can push them into a new sphere of activity or new surroundings or a new job. This story relates to a certain individual who also immigrated to Rhodesia. After three months he requested an interview with his boss and said that he would like to resign and go back to his country of origin. His boss was most surprised. "But my dear fellow, I had the impression that you were quite happy in your surroundings and in your new job."

"Oh yes, sir, I am that."

"Then what is the matter? Isn't the the salary high enough?"

"No, sir, the salary is fine."

"Housing conditions? We have provided you with a house, could that be the reason?"

"No, sir, the house is all right."

"Then why do you want to leave?"

"Well, sir, there is no scope for my wife's activities in this country."

"Your wife's activities? And what is she qualified for?"

"Well, sir, you see she is an under-water strip tease actress." (Laughter.)

We ladies can also be very truthful. Sir, this happened in my own home. You know, that when ladies get together we can start gossiping and talk of anything, usually about household troubles, servants, etc. Naturally ironing always comes in and we were discussing this topic when a lady visitor arrived and I mentioned that my iron was out of order.

"Well who are you calling in to repair it?" she said.

"My husband", was my reply.

"But can he?" (Laughter.)

Mr. President, I am also very politically conscious and even we ladies, when we get together, talk politics. I would like to talk politics to you this morning as well. In this little story our truthfulness will be amply demonstrated. We can't tell a lie, sir. That is definite. A certain Inspector visited one of the Northern Transvaal platteland schools to test the I.Q. of the class and he thought that he would test them on local government, etc. We are all tied up with local government, so I think you will appreciate this. The first question he asked was:

"Children, when I came to the school this morning, I travelled along a beautifully tarred road at speed. Who gave us that road?"

I would ask you to remember that this story occurred in 1948 when a certain Government had just come into power in the Union of South Africa.

Up went little Johnny's hand and he said: "Doctor Malan, sir."

The Inspector wasn't very worried, he thought: "I will get them off that soon," and said, "Now, this beautiful school building, these school benches, who gave them to you?"

Up went another little hand:

"Doctor Malan, sir."

The Inspector was getting worried. "Your beautiful sports fields outside, who gave them to you?"

Up went another little lad's hand:

"Doctor Malan, sir."

Now the Inspector was really worried. "When I look outside the window and I see our beautiful clear sky and our lovely mountain ranges and our sunny South Africa, who gave them to us?"

A very little shy hand of a little girl went up:

"God, sir."

As one, the class shouted: "Chuck her out, she's United Party!" (Laughter.)

Mr. President, Your Worship, it falls on me to thank the City of Salisbury for the very fine entertainment you arranged for the ladies, and, in thanking you for that, I must speak of the informal gathering the first night we arrived here, the Civic Sundowner, the Convention Ball, the lake and boat trip, and the braaivleis with its beautiful coloured lights which have been remarked on before. All these, I think, have made this visit for the Ladies worthwhile. They were so well entertained that they forgot to look after their husbands.

I have one little duty, Sir. Unfortunately Mrs. Ewing, our Secretary's wife, fell ill and to her goes out our best wishes for a very speedy recovery. We wish to thank you again, Salisbury City Council, the Electricity Department Staff, the ladies that assisted with the tea, and all others and in particular, Mrs. Mitchell, who took care of us so very well. Thank you, Mr. President. (Applause.)

THE PRESIDENT: Thank you, Mr. Van der Walt, thank you Ladies. The floor is now open for other speeches.

Mr. BLIGNAUT (Pretoria): Mr. President, on behalf of the City Council of Pretoria I have great pleasure in extending our heartiest thanks to your Mayor and Mayoress and their Council for the hospitality bestowed upon us during our stay in Salisbury. We can assure you that we enjoyed it and appreciated it very much. The arrangements were really "tops", the officials were champion. Mr. President, to you and your wife, Mr. Ewing and your staff, my personal thanks for your friendship. May you have a very successful year of office. My beste wense vir u almal. Dankie. (Applause.)

THE PRESIDENT: Thank you, Mr. Blignaut.

Mr. MILLAR (Bulawayo): Mr. Mayor, Mr. President, Ladies and Gentlemen, Mr.

Gripper having twisted my arm and suggested that Councillors do not take part in these proceedings, I do want to say at the outset that before an array of electrical intelligentsia, shall we say Councillors are at the best of times somewhat diffident about taking part in the discussions of a Convention of this sort. But, of course, you are well aware of the fact that the reason that the Convention arranged for a photograph to be taken during the first session is so that those Councillors who are here first of all will be able to show up in the photograph. I thought it would be wiser in addition to that if I stayed to the last session and make what small contribution I intend to make to this discussion having at the very last, so that they can say well we don't know what happened in between, but Millar was there at the beginning, and he was there at the end.

As Chairman of the Bulawayo Electricity Committee I am often asked certain technical questions about electricity. I think some mention was made of that this morning that Councillors should acquaint themselves with all these details in order to have a better liaison between consumers of electricity, and, in addition some of their rate-payers. So I did a bit of research into this, and, surprising though it may seem to you, it was discovered that Benjamin Franklyn could really be classed as the Founder of electricity because he produced electricity by rubbing cats backwards. Unfortunately there is no mention made of how many cats he required for the output of a 33 kV. set, but I will leave that to your imagination.

During, I think either the first or second session of this Convention some little mention was made of a twist on the word apartheid being half past nine or words to that effect. Perhaps it would be appropriate if I tell you a little story about time, because time is quite a big factor with electrical undertakings. This is a conversation between a Chinese Doctor and his patient which took place over the telephone, and the Chinaman said:

"Doctor what time you fixe teeth for me."

The Doctor replies: "2.30 all right?" "Yes," said the Chinaman, "tooth hurtee, but what time you fixe."

Mr. President, I have come to the end of what I have to say except for the most important part of it and that is on behalf of the Bulawayo City Council I want to express Bulawayo's thanks, Mr. Mayor and President, for the grand hospitality which has been afforded to Mr. Sibson, and His Worship the Mayor of Bulawayo and myself during our visit. It was mentioned this morning that the only thing Bulawayo has in common with Salisbury is our temperature, but during Mr. Lynch's paper he mentioned about the wide streets. Of course I couldn't possibly let that go without suggesting to those delegate that have seen them, that the streets in Bulawayo are even wider. During the vote of thanks that was passed to Salisbury, mention was made of the replica of the Victoria Falls. You will appreciate that it would be quite a formidable task for Salisbury to transfer the Falls to Salisbury, so they have done the next best thing. They have a replica for you to see. Bulawayo, at least, will be able to hang on to them for some time to come. Thank you, Mr. Mayor, Mr. President and Ladies and Gentlemen.

THE PRESIDENT: Thank you, Cr. Millar. Any further speeches?

Mr. GRIPPER (Port Elizabeth): Your Worship, Mr. President, if you will bear with me for two minutes I will read a little account giving a history of electricity which appeared in the Electrical Press in 1952. It reads as follows:

The Greeks invented electricity. They did it by rubbing amber with cats fur, this made the amber attract small particles and the cats fur to stand on end. It was only natural really, as the cats did not care much for being rubbed on amber. The Greeks did not do anything else about electricity as they were busy at the time with a war. The next to do anything was an Italian called Galvani who found a way to make frogs legs twitch by electricity. Neurotic frogs could twitch already without Galvani, but nevertheless the discovery was very important and it led Volta to invent his cell. Volta's cell was very useful and very popular and he made a great deal of money out of it, hence the expression "Volta's pile". (Laughter.) Volta also invented volts which are the things that push amps around the circuit. Actually amps were not

invented until 50 years later, so the volts had to push around on their own for a bit. (Laughter.) This gave rise to static electricity which is very interesting, but not very useful. It is used mostly for lightning. After Volta, the electricity business became very brisk.

Ampere invented amps, Ohm invented ohms, Watt invented watts, Milli invented milliamps and Meg invented megohms, the latter show the early influence of women on electricity. (Laughter.) However, it has since been proved that all these were really invented by a Russian called Serge Arcover. He didn't mention it at the time as he was on nights!

The turn of the 18th Century was now nigh, it turned after 1799 as predicted, and electricity went along at a great pace. Coulomb invented Coulombs and Henry Henrys, Eddy invented eddy-currents, Gauss invented geese. (Laughter.) Evershed invented vignoles, and Baden-Powell invented Boy Scouts. (Laughter.) At this stage electricity was getting on very nicely when Clark Maxwell put the whole thing on a mathematical base and he took half the pleasure out of it. The greatest inventor of all was Faraday. Now Faraday was sickly as a youth, but he got better and invented the electro magnetic induction. This enabled electricity to be made in large pieces, and without it we should not have all the benefits of modern civilisation, such as wireless sets and atom bombs. Faraday was a prolific experimenter, and some of his experiments are classics. He conducted the ice pail experiment, the butterfly net experiment, the Faraday cage experiment. He also experimented with electricity. After Faraday electricity business got very big, and it was not long before people began selling it for money. This took the other half of the pleasure out of it and gave rise to a vast hierarchy now under the control of administration and policy makers. These are very important people, and are very busy making politics and policies, they were naturally of much more account than the old fashioned types, who only made electricity.

Nowadays there are two sorts of electricity DC and AC. DC is a bit old fashioned and goes the same way all the

time, but AC comes and goes. It goes mostly in the mornings about 8 o'clock just when you need it most. (Laughter.) The supply keeps getting better, but the demand gets better as well, so nothing happens, this is called a vicious circle. Now vicious circles are very dangerous and can turn into inflationary spirals it not carefully handled. This is called economics. Economics is a very difficult subject and is different altogether from electricity. Thank you, Mr. President. (Applause.)

THE PRESIDENT: Thank you, Mr. Gripper.

May we have Mr. Berry on behalf of the Commercial please?

Mr. BERRY (Johannesburg): Mr. President, Your Worship, Ladies and Gentlemen, it is my privilege on behalf of the Commercial people present, and one or two others who have asked to be associated with these remarks, to associate all with the votes of thanks which have already been passed. In addition I would like to say how much we have appreciated being in Salisbury, the organisation has really been supreme.

In the first place you have arranged the weather, in the second place we have been in a very beautiful City, and in the third place we have been entertained royally, and, if I may add another, because there are four instances, we wish to express appreciation for the amazing organisation which has contributed so much to our pleasure. From the moment when we landed, those who came by air, we were whisked from the Airport to our Hotels. We have been carried wherever we wished to go, and we are well aware of the enormous amount of work which must have taken place behind the scenes to have made so much a contribution to our comfort. For all these things Mr. Mayor, for the delightful hospitality of your Council we say thank you very much.

At the same time I understand I have also to speak for the Ladies who accompanied the Commercial people, they wish (I can't be one of them for very obvious reasons) they wish to say thank you very much, and to you, Mr. President, we all tender our heartiest congratulations and

wish you success during your year of office. Thank you. (Applause.)

THE PRESIDENT: Thank you, Mr. Berry. Are there any other speeches? In that case I will call upon His Worship the Mayor to reply to the speeches of thanks.

HIS WORSHIP THE MAYOR: Mr. President, Ladies, and Gentlemen, you have now come to the end of your wonderful Convention, and it is a sad thought that you now have to take your departure. I want first of all to apologise for not having made an earlier appearance at this Convention, I could, of course, plead Mayoral duties are pretty hectic, but I don't think that would go down very well. But I do plead ignorance on the subjects which you had under discussion. As I told you yesterday, I have always fought shy of very highly technical people. The City Council, I feel has been excellently represented by my worthy colleague here, Alderman Morton Jaffray, so I hope you will forgive me for not having come here before.

I want to thank very much indeed those speakers who have paid such glowing tributes to us, to this Council, and in particular to Mr. Mitchell and his Department who, as you have said, have done a wonderful job to look after you during your short stay here. (Applause.) As I expected I have heard wonderful reports about the unqualified success of your Convention, the high order of the papers, the talks, the discussions, and the deliberations. I am sure as a result of these deliberations you will have beneficial and far reaching results in the future. After all these Conferences are made for this purpose, for establishing contacts and for finding out each other's problems, and these two countries have common problems as well as very close ties. I feel that your visit has done a great deal to cement even further the bonds of friendship which has always existed between our respective countries. I hope that these ties will increase from time to time, and your visit too has come at a very appropriate time, the time that this City in this particular month has celebrated its 21st anniversary as a City. I feel too, that your visit will always be looked back on especially by

me as one of the land-marks in our history. It has been the biggest Convention ever held here, with certainly the biggest functions, and I take great pride that I should have had the honour of being the Mayor of this City to welcome you.

I do hope that you have all enjoyed your stay here in Salisbury, that you have made many friends, in fact I am sure you have done, as I have done, and I hope that it will not be long before you will come back here and you will give us the opportunity again of offering you our hospitality. (Applause.)

THE PRESIDENT: Thank you, Mr. Mayor. It now becomes my duty to finally close the Convention. First of all I want to thank His Worship the Mayor for the very great assistance and encouragement he has been to me during this period, and for the way he has come to every function which we have asked him to come, and for the way in which he has really entered into the spirit of this Convention, despite his other commitments. I must also thank my staff who have worked as a wonderful team, they have actually done a marvellous job of work. (Applause.) I should not actually mention any of them by name, because they have all done a wonderful job, but one in particular, my Chief Clerk, Mr. Standing, has really been the brains and the organisation between the whole issue. (Applause.) I also want to thank my wife who has been a source of encouragement through the whole time and has even had to take notes about 3 o'clock in the morning when I have woken up and thought about something. (Applause.) Thank you very much indeed, my dear.

And now I come to the end of this Convention, if you have all enjoyed it as much as I have then you have had a good time indeed. I thought when I came to this point that I should be very pleased, in fact I am very sad, but it is now my duty to say that the 30th Convention of the Associated Municipal Electricity Undertakings of Southern Africa is now closed. Thank you. (Applause.)

All sing "For he's a jolly good fellow." Three cheers.

ADDRESS GIVEN AT THE
CONVENTION CIVIC LUNCHEON
BY THE PRESIDENT,
Mr. J. E. MITCHELL

Mr. Mayor, Honourable Ministers, Ladies and Gentlemen,

It had been my thought that this lunch would be accompanied only by speeches made by men long practised in that art, and of which we have masters here today.

I am, however, grateful for the opportunity afforded to me of being able to welcome, as your President, the Minister of Power, Sir Malcolm Barrow, who has given up a considerable amount of his valuable time to this Convention this week.

The Salisbury Municipal Electricity Undertaking has been fortunate in having a Central Government Cabinet for so long, comprising men who have taken such a vital interest in this City's electricity undertaking. I would not, of course, like to think that the reason behind this interest was due to the fact that during our load shedding years the Department was no respecter of persons and democratically load-shed the Prime Minister, the Governor and Cabinet Ministers on their selected nights (selected, by the way, by the Department and not by the important persons concerned), nor would I like the members of the Cabinet to think that the Department was so democratic in its approach simply to obtain that interest.

I must not refer to the other distinguished guests at this top table at this juncture or I feel I shall be accused by my Chairman of Public Works of stealing his thunder.

I would also like to take this opportunity again, on behalf of our Association, of thanking the Mayor and City Councillors for their exceedingly fine hospitality which they have extended to us. (Applause.)

I have been carrying out certain researches into facts about conventions of this Association which have been held in Salisbury previously, and after the Mayor's remarks about the fact that it would appear City Electrical Engineers are shortly to be superfluous, those researches have left me a little worried.

I find, for instance, that the first Convention of this Association to be held in

Salisbury was in 1934, shortly before Salisbury attained the dignity of a City, the coming of age of which was celebrated on the 3rd May, six days ago. At that function the Mayor in office was then Councillor L. B. Fereday, and I think it is a sign of the very stable local Government of this City that we should be able to have at our table today Alderman Fereday, still on the Council and still a chairman of a Committee, and none less than the Finance Committee. (Applause.)

That Convention was quite unique in that the Mayor held a civic lunch at the Mermaid's Pool and—I do not suppose this has been done before or since—some of the guests sat down to feed in bathing costumes. As a matter of fact one of those guests was a certain Jack Russell, who is with us today. I understand that one of his reasons for being late for lunch was the fact that another gentleman, who is also with us today, namely George Chaloner, was responsible for finding two delectable young females to accompany a couple of benedicts, one of whom was Jack Russell.

The Town Electrical Engineer at that Convention was Mr. Metelerkamp who, almost immediately after the Convention resigned from Council's service.

At this juncture I feel I should like to tell you a story about the late Mr. Metelerkamp, who was quite an unusual character, and a very fine one at that. One day he was called in to a house because the consumer had complained that everybody was getting electric shocks from the water taps. Mr. Metelerkamp strolled into the room, gripped hold of both the taps, and said "I can feel nothing".

The humour of this story cannot be seen, of course, until you know that in fact, Mr. Metelerkamp was almost a forerunner of Group Captain Bader, because he lost both his legs in the Air Force in the first World War, and had two artificial legs, and of course was well insulated. (Laughter.)

The next time that a Convention of this Association was held in Salisbury was in 1945, and the Mayor in office that year was then Councillor Charles Olley, and again you will find that the same Councillor, elevated now to the rank of Alderman, is still a Councillor and joins us at this table. He is, like Alderman Fereday, chairman



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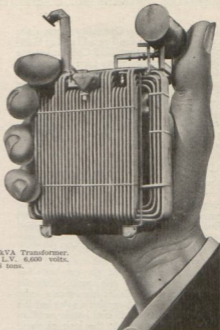
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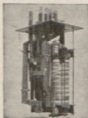
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of one of Council's Committees, none the less this time than the Town Planning Committee. Again, at that 1945 Convention the Council delegate was then Councillor Morton Jaffray, who, since that date, except for the two years when he held the office of Mayor, has held the chair of the Public Works Committee from that day to this and has, at this year's Convention become one of the first two Councillor delegates to be Honorary Members of the Association. (Applause.)

I also find, however, that this is where my research is starting to worry me, for immediately after the last Convention, the then City Electrical Engineer, Mr. Clinton, resigned his position. You will realise, therefore, that I shall be asked if I have not already got my resignation in my pocket, as it is obvious I shall be expected to carry on in the same strain. (Laughter.)

As you will have realised since you were last in Salisbury in 1945, the emphasis has been on homes for the people for the tremendous amount of immigrants who have settled in Salisbury during the last ten or eleven years, and not hotels or City Halls. Salisbury regrets the lack of these facilities as much as you do, but I think you will agree that the priorities which have established themselves have been correct.

In view of the fact that, as you have heard, Salisbury has developed at twice the rate of most other cities in Africa, I think you will agree that the Council of this City can be congratulated on carrying out this development with as little loss of the charm for which this City has been noted, and of which it has been so proud.

These inconveniences will shortly be overcome, but I think it would have been most unfortunate if this Convention should have delayed its next visit here until that time, as the members here would not have understood half so well the difficulties caused by such a rapid rate of development.

The A.M.E.U. has, as its main objects:

1. To promote the interests of Municipal electricity undertakings;
2. To bring the Municipal Electrical Engineers and Chairmen and Members of Municipal Electricity Committees together;

3. To arrange and hold periodical meetings for the reading of papers and discussions of subjects appertaining to Municipal electricity undertakings;
4. To take such action as may be lawful and expedient for the protection and defence of the rights or interests of Municipal electricity undertakings;

and I would like you to note that in all cases the objects refer to Municipal electricity undertakings and not to Municipal electrical engineers.

Now, Mr. Mayor, I would not like you to think that the visitors from the South African E.S.C., the South African Electricity Control Board and members of similar organisations here in Rhodesia merely come to our Convention just to see what the Municipal undertakings are up to. They come because the A.M.E.U. is not narrow in its outlook, and welcomes co-operation with all bodies who have the welfare of the whole of the electricity supply industry at heart.

We also have affiliated to us representatives of those commercial firms, industries and consultants who have a fairly substantial stake in the electricity supply world. I can assure you that Municipal engineers play no favourites, and are known to drive hard bargains with their commercial fraternity. They are nevertheless our firm friends and it is surprising how this makes it so much easier to transact business. I have never found a similar relationship in any other industry, or for that matter, in any branch of engineering. (Applause.)

You will notice, Mr. Mayor, if you attend other Conventions of this Association, that the delegates are in the majority of cases accompanied by their wives, and it might be thought that this would place some hinderance on the enjoyment of the Councillors and Engineers concerned, especially out of Convention hours. I would remind you, however, that this is a Convention of electrical people and they, fortunately, have very many types of devices with which they can control any of their accompanying ladies who is likely to get out of hand, and this is how we use the devices referred to:

If a woman is sulky and will not speak—
Exciter.
If she talks too much—Interrupter.
If she gets too excited—Controllor.
If her way of thinking is not yours—
Converter.
If she is willing to come half-way—Meter.
If she will come all the way—Receiver.
If she wants to go further—Conductor.
If she wants to be an angel—Transformer.
If you think she is picking your pockets
—Detector.
If she proves your fears are wrong—
Compensator.
If she goes up in air—Condenser.
If she wants chocolates—Feeder.
If she sings inharmoniously—Tuner.
If she is in the country—Telegrapher.
If she is a poor cook—Discharger.
If she eats too much—Reducer.
If she is wrong—Rectifier.
If she gossips too much—Regulator.
If she fumes and splutters—Insulator.
If she becomes upset—Reverser.

Mr. Mayor, I thank you for your toast to our Association, and assure you again that the Association appreciates all that this Council has done for it at this Convention.

TOAST TO "THE ASSOCIATION"
GIVEN AT THE CONVENTION CIVIC
LUNCHEON BY HIS WORSHIP THE
MAYOR, COUNCILLOR
HARRY PICHANICK, M.B.E.

Mr. President, Honourable Ministers,
Ladies and Gentlemen,

To me has been assigned the honour, at this most distinguished assemblage, certainly the largest function of its kind ever held in Salisbury, of speaking before a galaxy of highly qualified technical people, whose claim to fame is centred round kilowatts, megawatts, gigawatts, terrawatts and what nots, as we say in this country.

It is customary on such an occasion for the Mayor to propose a toast to an association such as yours, however unfamiliar he may be with your profession or calling. It is very rare that Mayors, like myself, are anything but the usual, ordinary layman, who has to acquire what little technical knowledge he can, during his service on Council.

It calls to mind the statement alleged to have been made by a famous Prime Minister, who always said that you must never pick a minister who has an expert knowledge of his portfolio. Far better to select someone who is willing to work and learn.

As a Councillor, I may have qualified in the latter category, but as a Mayor, I do not qualify in either category, and in proposing this toast to your association, I plead ignorance of any technical knowledge of electricity, and very little knowledge of electrical engineers.

It is true that, in my seven years on Council, I have got to know Mr. Mitchell pretty well, and I formed the impression a long time ago, that, whilst he is not exactly a millionaire, he never talks in less than millions—either millions of watts or millions of pounds, or both!

It is really quite amazing how City Electrical Engineers get away with so much money, and how easily Councillors fall for their schemes. It may be necessary, in the years to come, for prospective Councillors to have some technical knowledge or experience, if they wish to know what is really going on, because these engineers and scientists talk quite a different language.

I remember visiting Torquay three years ago, where there was a Municipal Engineer's Conference, and a crowd of delegates were staying at our Hotel. I met the City Electrical Engineer of Birmingham, and asked him whether these conferences achieve very much.

His answer was: "We'd get something done if we didn't have so many damn Councillors doing all the talking."

Nevertheless, I am sure that Engineers will agree that Councillors are a necessary evil, and that they have a role in Municipal life. In some cities, they have a different 'roll', mostly after late meetings, but that doesn't happen here as our Councillors have a steady gait, especially those on Public Works Committee.

Mr. President, we all know that electricity is the life blood of humanity. In this modern nuclear age, we have seen a tremendous advancement in the methods

of generating electricity, in the production of cheap power, and the enormous use put to it. The demand throughout the world for light and power has become almost insatiable, and the loan funds required are running into astronomical figures.

Rhodesia's pet word today is *Kariba*. It is a word, and it has a meaning that has spread like wildfire into the minds of every person in the territory — white, black or colourless — and its immensity and — if I dare mention it — its huge cost, has not only left most of us breathless, but it has staggered the outside world, to such an extent that all the required funds have been raised.

Perhaps the courage and audacity of a small country, with a handful of civilised people, in undertaking the greatest project in Africa, so impressed the world that they opened their good hearts, and their purses, in sheer admiration.

In course of time, this mammoth hydro-electric scheme will be a great boon to the Municipalities, and will probably relieve us of capital expenditure on thermal power stations. Loan funds, if still given to us, can then be used to step up the requirements in housing and other essential services.

Our City Electrical Engineers should have soft jobs by that time, but what is causing us a little concern is the fact that soon we shall become a subject people in this territory, if the stories I hear about the Electricity Control Act are true.

You probably do not know that my friend, the Minister of Power, is taking all Electrical Engineers and their productive capacity, completely under his control. I don't think the Minister contemplates putting them out of work — that would be unethical and unwattlike — but what it will be like under the control of a Powerful Minister, we do not know.

In thinking of Government control, one's mind goes back to the early days of this world, to the first Chapter of Genesis, when God said, "Let there be light, and there was Light". No doubt, a little light was needed in those dark days, though with only one woman on earth, Adam had fewer troubles than we have today. Even Eve felt more complacent

than the average wife of today, for she did not have to be concerned as to whether her husband had the roving eye for female beauty. Besides, there were no City Electrical Engineers in those days to impose any load shedding or blackouts, and Adam always got his *sadza* well cooked and served hot on the dot.

Perhaps the analogy from those biblical days is not inappropriate, for, under the control of the Minister of Power, and without any competition, we might almost say that he is another God to whom we shall say—let there be light and there will be light, but not at the price Adam paid for it!

People in this City have, for years, complained of the lack of street lights in the proper places. I have no doubt that City Electrical Engineers in South Africa are no different from ours, because our spoil-sports love putting lights in dark places, and spoiling young people's fun, especially that street light right across the front porch. You have no idea how it annoys our young Romeos when they want to say goodnight to their young Juliets in the true fashion. In Salisbury's prehistoric pioneering days, it used to be more fun carrying about a lantern and turning it down at the appropriate time, but of course, nowadays, they simply switch off the car lights.

I suppose the Electrical Engineer's motive in putting in so many lights in dark places is actuated by a desire to improve the world's morals, but little do they realise that these young Romeos and Juliets need no artificial light on such occasions, when they experience much more than a mere 230 volt through their systems. And the light in their eyes would provide far greater illumination than anything the electricity department, or even a *Kariba* Scheme, could provide.

Mr. President, your Association is certainly a powerful undertaking, and it has unquestionably made tremendous advancement in this frightful age of nuclear science and unbelievable inventions.

I must concede, however, that, the use you put to electricity is undoubtedly for the benefit of the people you serve, and your undertakings play a very large and important part in all fields of your operations—administrative, technical and even

legal, and that is why you always get away with so many things.

And your requirements are likely to continue in astronomical figures, as you come to the end of thermal power, and pass on to the next stage of hydro-electric power, such as Kariba—a really priceless gift.

And then perhaps, in the not too distant future, you will confront us with billions instead of millions, when you come to the use of atomic power. By then, my younger son will be qualified in the intricacies and delicacies of atomic energy, and I hope he will find a job in Rhodesia, so that I can keep a check on his aspirations towards astronomy.

I read a report the other day by Professor Todd of Cambridge University, who said that it is essential for our survival that the number of trained scientists and engineers be greatly increased, and that greater use of such technical experts be made on boards of industry. What I think we really need is a few Councillors fully qualified to cope with our City Electrical Engineers to tone them down a bit.

In this nuclear age—the fifth age of man, the layman is going to become an outcast. In the years to come, everybody is going to be so highly technical that, technically speaking, Council meetings will become just a series of pressing buttons and switching on various currents, so that the human brain is not taxed as it is now. It all depends, of course, if the Councillors will press the right buttons, otherwise they might blast their officials and ratepayers into extinction. Or it might be vice versa, and what a lot of fun there would be. I know an Aldermanic colleague of mine who would always be pressing the red light of dissension.

It is a fact that the greatest international question of all times is that, the world should not be overwhelmed by what it has created. A lot depends on international human goodwill, including the goodwill of all City Electrical Engineers. In time, atomic energy will provide cheap power enabling man to produce and live more fruitfully. But man will not live on atomic energy alone, for there are other great discoveries which may greatly change our lives. Perhaps in time, man will control his

own growth, and even a cabbage may become a City Electrical Engineer or a Councillor, or even a Politician or, perhaps better vice versa.

But before all that happens, let me express the hope that when you come here again for your next Convention, and I trust it will not be as long as eleven years, you will have found the answer to cheap power, lights in the right places, and an unlimited supply of loan funds.

Before I conclude, may I say how proud we are that you have chosen our own City Electrical Engineer, Mr. Jimmy Mitchell, as your President. It is a great honour for Salisbury, and only the second time in the long history of your Association, I am sure that, in his hands, your Association will be as safe and as successful as his own Power Stations, and they are pretty safe, as we have had no load shedding for a considerable time.

I also congratulate many of your delegates on their thoughtfulness in bringing their wives with them. Ladies do have a sobering effect on delegates, who might otherwise do less work during convention hours.

Mr. President, I have nothing but praise for the successes your Association has achieved over the years, and I trust that its strength will grow from little watts, to big watts and mighty watts, and without any further ado whatsoever, I ask you all to rise with me while I give you the toast—"The Association".

REPLY TO TOAST OF "OUR GUESTS."

Mr. Mayor, Honourable Ministers, Ladies and Gentlemen. We, your guests, are now so confused with so much hospitality, entertainment and instruction, that we really do not know whether Christopher Kariba discovered Jimmy Mitchell or vice versa.

Mr. Mitchell has solidified us with papers in the Conference Hall, liquified us with refreshments at Cocktail Parties, gassified us with the exuberance of his inimitable verbosity and I now hear he is offering reduced terms at his electric crematorium for elderly delegates who cannot take the strain.

When I take home to-day's fine menu and show it to my youngest son, he will probably say: "My! daddy, you have been well Federated."

You have made us all ambassadors of goodwill for your great country. We have had a grand time and will soon be on our way full of happy memories and bicarbonate of soda.

Some of us will take the high roads and some the low roads, but Cecil Rhodes dreamed it all before yea. So may we and our true loves someday meet again on the bonny, bonny, banks of Kariba! Thank you, Thank you!

Mr. Mayor, Mr. Deputy Prime Minister, Honourable Ministers, Ladies and Gentlemen, I have not always believed in confessing to my shortcomings unless I can hide them no longer, but I do so on this occasion because I shall shortly be making it apparent to you that this is the first time I have risen to propose the toast of "Our Guests".

I feel like echoing the prayer of the pious Indian boy who fell head first into a drum of molasses, and as he emerged with a treacle syrup trickling down his hair and nose, was heard to mutter "Lord, make my tongue equal to its task". However, I am very grateful to be given this privilege, as I have vivid recollections of the last occasion on which we had the pleasure of having the Convention in Salisbury, which was in 1945.

When I welcomed the Executive Council of the Association on Saturday morning, I told them that there had been many changes since that time and that, apart from Alderman Olley, I was the sole survivor of the Salisbury City Council of that year. I also pointed out that there were only two members of the then Executive Council still holding office, namely, the two good looking ones — the immediate past President, Mr. Dick Hugo, and myself. Mr. Hugo has since reminded me that he was unable to be present in Salisbury in 1945, so it would appear that only the best looking member has survived.

As always, we must mention the ladies first, and I would like to say how delighted we are to have them with us here. I had

hoped to gain inspiration from a man who always described his wife as a perfect angel: but on enquiry I found that his reason for doing so was that her head was always in the clouds and she was constantly harping on some thing or other. Nevertheless, I hope the ladies have enjoyed their stay with us, and have visited our many delightful shops but that these visits have not come too hard on their husbands' pockets.

We are proud indeed to have as our guests today so many who, in one way or another, are rendering service, intellectual, political and electrical, in accordance with the highest traditions of their respective spheres. If I mention the names of only some of our guests, please do not think I am overlooking anyone.

I come now to our Councillor delegates whom I am sure will all agree with me that without their able support and guidance the engineer would not get very far, and I hope they, too, have learnt a lot and enjoyed their visit to Salisbury.

Coming to the Municipal Electrical Engineers, I have no hesitation in saying that they are a fine, good looking bunch of fellows, modest and unassuming to a degree, which is illustrated by a remark made by one of my engineer friends that the green badge of the engineer signifies his always being ready to get on with the job, whilst the red badge of the councillor holds him back. Another good illustration of these qualities is no other than my own Engineer — quiet, bashful, never asserting himself, and when from time to time Council proves difficult and grills him about the necessity for another two or three millions for the Department, I have to rally him with that famous warcry of the electrical engineers: "Illegitimo non carborundum". Translated, that means — I'll leave it to the next speaker! However, in view of the signal honour conferred on me on Monday, when I became one of the first two Councillors ever to have been appointed an honorary life member of the Association, I had better now take a more serious note, and say that for service in accordance with the highest traditions of local government, to industry, commerce and the man in the street, we immediately

think of electrical engineers and of their Association, which is holding its 30th Convention in our City. Whilst on the subject of engineers, I would refer to our ever-green past City Electrical Engineer, Mr. Tubb.

To the blue ticket boys — I mean, of course, our commercial friends — I express the hope that they have had a very interesting and fruitful, I repeat fruitful, Convention, I can assure them that they are especially welcome in more ways than one, and I hope their close association with the A.M.E.U. will continue so long as the Association itself exists.

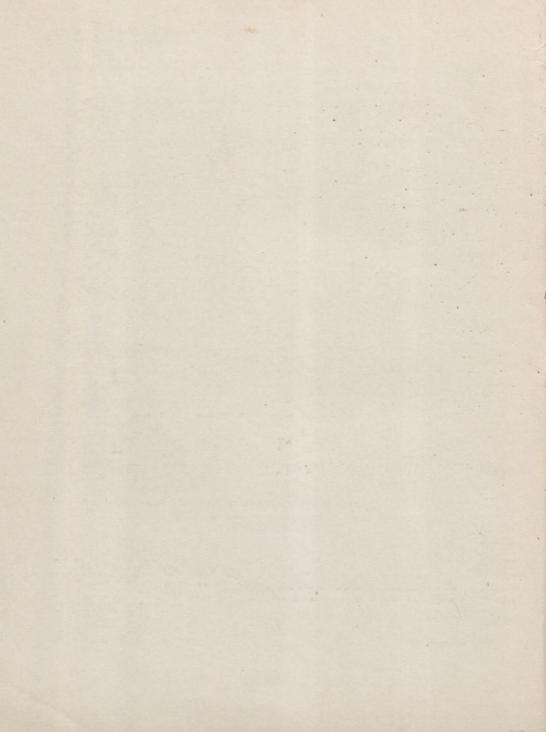
Next, I am sure you will all wish me to express our admiration and regard for Sir Malcolm Barrow, who is the Federation's first Minister of Power. He has just given us a new Electricity Supply Act which in some respects is worse than the one we had before but, in spite of that, I ask you to join with me in saying "More power to your elbow providing we get it cheaper than we can make it ourselves".

We are very pleased to have the Federal Minister for Transport and Communications, Sir Roy Welensky, with us today, but it is nevertheless most disconcerting to find that he has acquired a

pronounced American accent during his recent visit to the United States. Strong rumours are circulating that his mission to America to exchange Rhodesian tobacco for American locomotives was not entirely successful, but if he has brought some dollars and bright ideas back with him, his trip will not have been in vain.

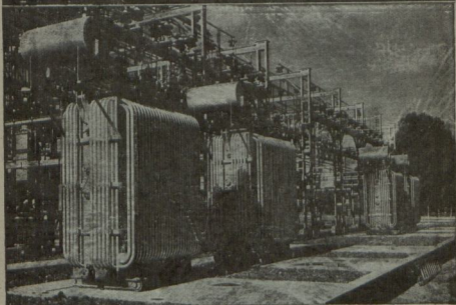
I should also like especially to welcome our Minister of Internal Affairs and Justice, Mr. Stumbles, and to say how pleased we are that he paid his water and light account before coming here to partake of our hospitality. You may take it from me that, not withstanding his name, he does not stumble over things, and we regard him as one of our brightest political leaders. Mr. Stubbles has done much for this country, and those of us who like a drink with a late dinner in a restaurant are especially grateful to him for having made that possible, and for his enlightened outlook on such matters.

Ladies and Gentlemen, it is my great privilege to give you the toast to our guests today, coupled with the name of my old friend and your President, Jimmy Mitchell, to whom I wish a very happy year of office, and a very prosperous one, and who I am sure will maintain the highest traditions of the Association.





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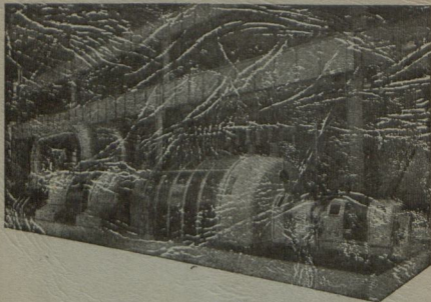


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