PROCEEDINGS

of the

Twenty-Eighth Convention

of the

Association of Municipal Electricity Undertakings

OF SOUTHERN AFRICA

(Founded 1915)

held at

BLOEMFONTEIN

From Tuesday, May 11th to

Friday, May 14th

1954

PRICE FIFTEEN SHILLINGS

6,000 MILE LINK-UP OF RELIABILITY AND TEAMWORK

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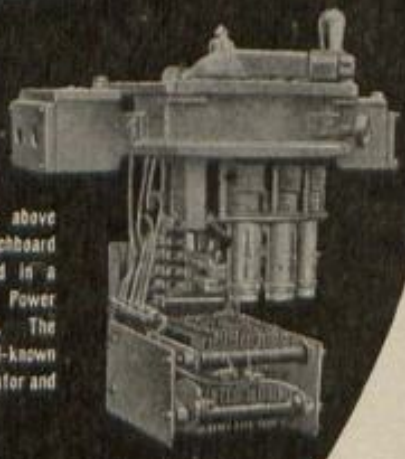

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These are the Head Offices of our Sole Agents in South Africa and the Rhodesias. More and more 'Erskine Heap' Switchgear and Motor Control Gear is being assembled in South Africa.

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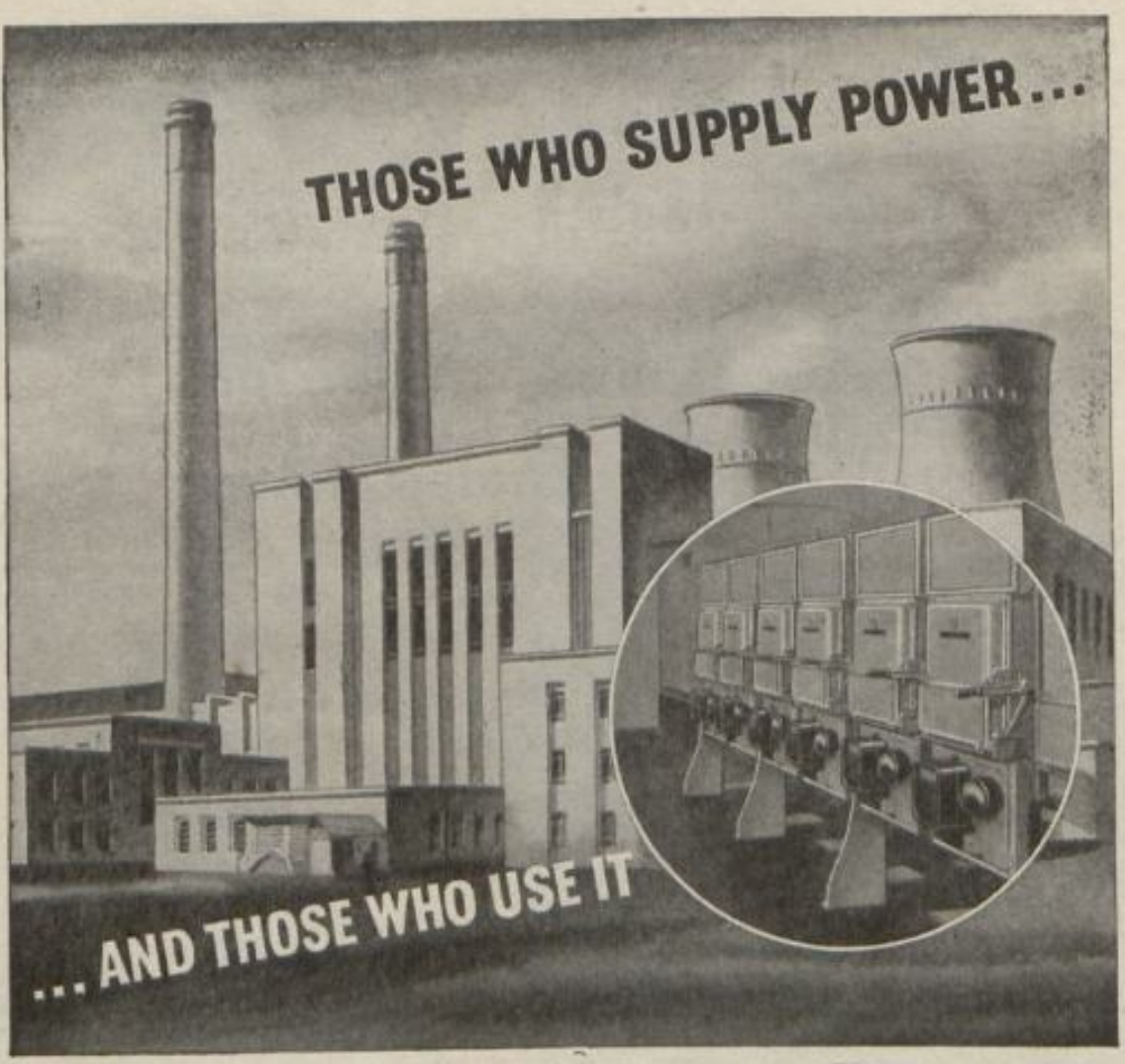

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of the

FIRST CONGRESS

of the

ASSOCIATION OF MUNICIPAL ELECTRICAL ENGINEERS

(UNION OF SOUTH AFRICA)

held at

JOHANNESBURG

From Monday, November 15th to Saturday, November 20th, 1915.

Back Row. — M. McDonough (Bethlehem), J. R. English (Heilbron), T. Jagger (Ladysmith), T. Millar (Harrismith), J. Roberts (Durban, Member of Council), T. C. Wolley-Dod (Pretoria), B. Sankey (Port Elizabeth, Member of Council), E. T. Price (Johannesburg, Hon. Treasurer), F. Castle (Oudtshoorn), G. H. Swingler (Cape Town).

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

EXECUTIVE COUNCIL 1954/55

President:

G. J. Muller (Bloemfontein)

Vice President:

D. J. Hugo Pretoria)

Immediate Past Presidents:

J. C. Fraser (Johannesburg)
A. R. Sibson (Bulawayo)

Engineer Members:

D. A. Bradley (Port Elizabeth)
J. E. Mitchell (Salisbury)
C. G. Downie (Cape Town),
J. L. van der Walt (Krugersdorp)
C. R. Hallé (Pietermaritzburg)
J. C. Downey (Springs)

Cities or Towns Represented:

Bloemfontein
Pretoria
Cape Town
Pietermaritzburg
Krugersdorp
Salisbury
Port Elizabeth
Springs

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

Secretary and Treasurer:

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

Sub-Committees:

Papers	G. J. Muller (President), D. J. Hugo (Vice-President), A. R. Sibson (Past President).
Wiring Regulations Committee	J. C. Downey (Convenor), G. J. Muller, C. R. Hallé, J. L. van der Walt, C. G. Downie, J. E. Mitchell.
Electrical Wiremen and Contractors Legislation Committee	J. C. Fraser (Convenor), D. A. Bradley, C. G. Downie, J. C. Downey.
Tariffs Survey Committee	J. L. van der Walt (Convenor), C. G. Downie, A. R. Sibson, J. C. Downey with co-opted members.
Representation Committee	J. C. Fraser (Convenor), J. C. Downey, D. J. Hugo, J. L. van der Walt.
Amendments to Constitution and Rules	G. J. Muller (Convenor), J. C. Fraser, D. J. Hugo.
Recommendations Committee for New Electrical Commodities	D. J. Hugo (Chairman), J. C. Fraser (Vice Chairman).

Representatives:

World Power Conference (Local Committee)	J. C. Fraser
Electrical Wiremen's Registration Board	J. C. Fraser
Coal Allocation Committee	D. J. Hugo, J. C. Fraser (Alternate)
Overhead Lines Code of Practice	J. C. Fraser, J. L. van der Walt (Alternate)
Safety Precautions Committee	J. C. Downey, J. C. Fraser (Alternate)
Meter Testing Code	J. L. van der Walt
S.A. Bureau of Standards	J. L. van der Walt, J. C. Downey (Alternate) with power to co-opt.

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

PAST OFFICERS AND MEMBERS OF COUNCIL

	Past Presidents :	Secretary and Treasurer :
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
		L. L. Horrell, Jan., 1941
1944–45	A. Rodwell, Johannesburg	L. L. Horrell
1945–46	J. S. Clinton, Salisbury	L. L. Horrell to Nov., 1945
	J. W. Phillips, Bulawayo	A. T. Taylor, December, 1945
1946–47	G. J. Muller, Bloemfontein	A. T. Taylor
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

PAST ORDINARY MEMBERS OF COUNCIL

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

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

Councillors :	Alternate Councillors :	Engineers :
	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, Harirsmith
		E. A. Behrens, Port Elizabeth
	1936–37 :	G. H. Swingler, Cape Town
H. Middlebrook, Durban	F. Morrell, Cape Town	T. Jagger, Ladysmith
T. P. Gray, Johannesburg	J. McLean, Port Elizabeth	E. A. Behrens, Port Elizabeth
		G. M. Pirie, Bloemfontein
	1937–38 :	L. L. Horrell, Pretoria
H. G. Capell, Durban	H. Middlebrook, Durban	J. S. Clinton, Salisbury
W. James, Cape Town	L. Hofmeyr, Stellenbosch	A. Q. Harvey, Springs
		G. M. Pirie, Bloemfontein
	1938–39 :	D. J. Hugo, Pretoria
E. Spilkin, Umtata	G. C. Starkey, East London	J. S. Clinton, Salisbury
W. James, Cape Town	W. Fowkes, Cape Town	A. Q. Harvey, Springs
		G. M. Pirie, Bloemfontein
	1939–44 :	D J. Hugo, Pretoria
E. Spilkin, Umtata	G. C. Starkey, East London	C. Kinsman, Durban
C. Olley, Salisbury	W. Fowkes, Cape Town	A. Q. Harvey, Springs
		G. M. Pirie, Bloemfontein
		W. N. Powell, Bloemfontein

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

1950–51:

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:—

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

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

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

Councils: 1953/54:		**Engineers:**
Johannesburg	H. W. Harrison	J. C. Fraser
Bloemfontein	G. A. Fichardt	G. J. Muller
Port Elizabeth	A. Markman	D. A. Bradley
Cape Town	A. F. Keen	C. G. Downie
Durban	H. L. Richardson	C. Kinsman
Salisbury	A. Morton Jaffray	J. E. Mitchell
Krugersdorp	M. C. Dames	J. L. van der Walt
Pretoria	C. E. Acton	D. J. Hugo

RULES AND CONSTITUTION

ASSOCIATION OF
Municipal Electricity Undertakings
OF SOUTHERN AFRICA

1. TITLE

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

2. OBJECTS

The objects for which the Association is formed are:—

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

3. MEMBERSHIP

The Association shall consist of:—

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

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

4. QUALIFICATIONS

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

(a) **Honorary Members** shall be distinguished persons who are or who have been intimately connected with Municipal Electricity Undertakings and whom the Association especially desires to honour for exceptionally important services in connection therewith.

(b) **Councillor Members.** The Member whose Chief Electrical Engineer shall have qualifications acceptable to the Council shall be the Committee appointed by the Municipality or Local Authority to have control over its Electricity Undertakings and shall be represented as regards its qualifications to vote by one member of such Committee.

(c) **Engineer Members.** The Member shall be the Chief Electrical Engineer engaged on the permanent staff of an Electricity Undertaking owned by a Municipality or Local Authority and who has had a thorough training in electrical engineering and is otherwise acceptable to the Council of the Association. After 1st June, 1947, one only duly qualified assistant in an undertaking with sales of over 20,000,000 units per annum may also be admitted to this class on the recommendation of the Chief Electrical Engineer.

(d) **Associate Members.** The Member shall be a Technical Assistant engaged on the permanent staff of any Electricity Undertaking represented by its Councillor Member and/or Engineer Member.

(e) **Associates.** Any member resigning from the Class of Engineer Member or Associate Member shall be entitled to apply for transfer to the class of Associate. An Associate may also be an Engnieer in the employ of an Authorised Electricity Undertaker other than a Local Authority who is engaged in the supply of electricity to consumers in the area of jurisdiction of a Local Authority.

5. ADMISSION OF MEMBERS

(a) The election of Honorary Members and other classes shall be vested in the Council.

(b) Councillor Members may be admitted on an application signed by the Town Clerk of the Municipality or Local Authority concerned.

(c) Every candidate for election into the Association as Engineer Member shall make application on the prescribed form suitably endorsed by two supporters who shall be either Engineer Members, Councillor Members or Members of the Committee of the Municipal or Local Authority in charge of the Electricity Undertaking of which the applicant is Chief Electrical Engineer.

(d) Every candidate for election into the Association as Associate Member or Associate shall make application on the prescribed form suitably endorsed by the Engineer Member on whose staff he is engaged.

(e) Every candidate for transfer to the class of Associate shall make application in writing for transfer.

6. CONTRIBUTIONS

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

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

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

SCALE OF CONTRIBUTIONS

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

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

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

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

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

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

7. COUNCIL

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

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

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

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

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

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

8. MEETINGS

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

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

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

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

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

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

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

MEMBERS, DELEGATES AND VISITORS ATTENDING THE 28th CONVENTION

ALIWAL NORTH
G. A. Lotter

ALBERTON
Cr. J. J. Schoeman
Cr. J. van Zyl
M. W. Odendaal

BEAUFORT WEST
J. P. Mostert

BENONI
Cr. S. C. Vosloo
R. E. C. Andrews

BETHLEHEM
Cr. F. A. Kemp
K. M. Fisher

BETHAL
M. N. Kirberger

BLOEMFONTEIN
Cr. G. A. Fichardt (Mayor)
Cr. F. J. C. Castelyn
G. J. Muller
C. F. Hafele

BOKSBURG
Cr. P. A. Venter, M.P.C.
E. L. Smith

BRANDFORT
M. J. S. Havinga

BULAWAYO
Cr. J. W. Phillips
A. R. Sibson

BRAKPAN
Cr. W. J. Ebertson
P. L. Vergottini

BOTHAVILLE
J. D. Hattingh

CAPE TOWN
C. G. Downie

CRADOCK
A. Rossler

DE AAR
J. A. Macquis

DURBAN
Cr. H. L. Richardson
R. M. O. Simpson

DEWETSDORP
A. H. J. Hatwich

EAST LONDON
P. A. Giles

ERMELO
P. C. Asselbergs

EDENVALE
R. V. Bailey

ESTCOURT
Cr. M. J. Moolman
J. G. F. Erikson

FORT BEAUFORT
J. H. Rogers

GATOOMA
P. C. Grandin

GEORGE
P. H. Newcombe

GRAHAMSTOWN
J. Iverach

GREYTOWN
Cr. W. L. Newmarch
J. S. Craig

GRAAFF-REINET
Cr. J. H. Greeff

GERMISTON
Cr. S. J. Hattingh
C. Lombard

HEIDELBERG
Cr. N. J. C. Greyling
J. F. Lategan

JOHANNESBURG
Cr. W. H. Harrison
J. C. Fraser

KIMBERLEY
Cr. L. Jawno
F. Stevens

KLERKSDORP
J. M. Gericke

KOKSTAD
W. G. Thackwray

KROONSTAD
Cr. F. J. Theron
W. Rossler

KRUGERSDORP
Cr. M. C. Dames
J. L. van der Walt

KEMPTON PARK
Cr. J. C. Kruger
L. Futcher

LADYSMITH
Cr. F. O. Rapson
R. E. Street

LOUIS TRICHARDT
Cr. B. J. P. Venter
E. L. Buchanan

MAFEKING
Cr. A. J. E. Holmes
G. E. H. Jones

MIDDELBURG, C.P.
D. Haig-Smith

MIDDELBURG, TVL.
Cr. H. Laver
N. A. Potgieter

NDOLA
J. Mc Gibbon

ODENDAALSRUS
J. van der Spuy

PAARL
Cr. E. du Preez
H. J. Relihan

PIETERSBURG
Cr. W. H. Mitchell
J. I. Inglis

PORT ALFRED
Cr. W. H. Muller
M. J. Kruger

PORT ELIZABETH
D. A. Bradley
PORT SHEPSTONE
Cr. S. H. Lowe
K. W. J. Halliday
POTCHEFSTROOM
Cr. C. J. Fourie
T. Kramer
POTGIETERSRUS
P. J. Vorster
PIETERMARITZBURG
Cr. C. E. K. Young
C. R. Hallé
PRETORIA
Cr. C. E. Acton
D. J. Hugo
PARYS
D. R. Pretorius
QUEENSTOWN
V. E. O. Barratt
RANDFONTEIN
Cr. P. Pretorius
J. R. Cherry
ROBERTSON
Cr. A. P. Malherbe
S. de V. de Villiers
ROODEPOORT-MARAISBURG
Cr. B. J. van de Vyver
D. D. Brown
SALISBURY
Alderman A. Morton Jaffray
J. E. Mitchell
P. Wrigley
SPRINGS
Cr. J. H. P. Milne
J. C. Downey
STANGER
J. L. McNeil
STELLENBOSCH
E. de C. Pretorius
SOMERSET WEST
Cr. R. C. Mackay
F. P. W. Hall
STANDERTON
Cr. E. J. Smith
C. B. Heunis
THEUNISSEN
J. C. v. d. Walt
UITENHAGE
Cr. T. R. Thomson
J. A. Mathews
UMTATA
Cr. H. R. Sissons
F. R. Waldron
UMTALI
Cr. H. Thyne
H. T. Turner
UPINGTON
Cr. B. Coetzee
J. C. Strauss
VEREENIGING
Cr. J. T. Nilson
A. F. Turnbull
VREDE
J. L. Rothman
VRYHEID
Cr. W. G. Rush
VENTERSDORP
H. Bähr
WESTONARIA
Cr. M. Bentel
L. Dreyer
WALMER
A. C. Simpson
WINBURG
J. W. Ross
WORCESTER
Cr. R. Mercer
W. C. Theron
WELKOM
R. W. Barton

OTHER MEMBERS

C. Kinsman (Hon. Member)
D. J. R. Conradie (Associate)
H. J. Gripper (Associate)
H. M. S. Muller (Associate)
G. C. Theron (Associate)
C. R. Burton (Associate)
G. A. Dalton (Associate)
E. W. Mole (Associate)
H. G. Simpson (Associate)
J. T. Williams (Associate)

DELEGATES

GOVERNMENT DEPARTMENTS

Electricity Supply Commission:

W. H. Milton

Other Departments:

Dr. O. Brune, South African Council for Scientific and Industrial Research.
G. Williams, Chief Electrical Engineer, South African Railways.
R. N. F. Smit, Chief Inspector of Factories, Chairman Electrical Wiremen's Registration Board and also representing Secretary for Labour.
C. L. Ferreira, Department of Public Works.
W. Budd and R. C. Hendrie, Engineering Division, G.P.O., Pretoria.
F. W. Joubert, Electricity Control Board.
A. N. Moralee, Inspector of Factories (Engineering) Bloemfontein.
G. C. Molyneux, Rhodesian Railways.

OTHER REPRESENTATIVES

J. W. Swardt, A. A. Middlecote, S.A. Bureau of Standards.
Prof. F. C. v. N. Fourie, Orange Free State Chamber of Industries.
J. C. Fraser, The Institution of Certificated Engineers, South Africa.
J. C. Fraser, Safety Precautions Committee.
G. A. Dalton, The South African Institute of Electrical Engineers.

VISITORS

Sir John Hacking, late Deputy Chairman (Operations) British Electricity Authority.
J. D. C. Baxter, Northern Cape Regional Electrification Board.
S. G. Redman, T. R. J. Bishop, H. G. Hampson, Merz and McLellan, Johannesburg.
H. R. Eason, Bloemfontein Master Builders and Allied Trades' Association.
E. E. Sharp, M.I.E.E., F.B.H.I., Cape Town.
Savell O. Hicks, O.B.E., M.I.Mech.E., Davidson & Co., Ltd., Belfast, Ireland.
E. C. Enfield, Representing Davidson & Co., Johannesburg.

REPRESENTATIVES—ENGINEERING COMPANIES

Aberdare Cables Africa Ltd.	R. T. Bates, J. C. Sutherland, B. Kenny.
African Cables Ltd	J. Berry.
Arthur Trevor Williams (Pty.) Ltd.	G. A. Dalton.
Aluminium Coy. of South Africa (Pty.) Ltd.	F. G. McDonald.
Babcock & Wilcox of Africa (Pty.) Ltd.	K. M. Johnston.
British Insulated Cables (S.A.) Ltd.	A. L. Sanders
Brush Aboe (Southern Africa) Ltd.	P. N. Vickerman.
British Thomson-Houston Coy. (South Africa) (Pty.) Ltd.	H. G. Val Davies.
British General Electric Co. (Pty.) Ltd.	W. J. Hill.
Cooper & de Beer (Pty.) Ltd.	C. L. de Beer.
Contactor (Pty.) Ltd.	D. R. Pigot.
Caltex (Africa) Ltd.	W. H. Scharges, J. W. Regan.
Dowson & Dobson Ltd.	W. D. Hutty, J. R. Wheating.
Enfield Cables (South Africa) (Pty.) Ltd.	A. E. Torrance.
English Electric Coy. of South Africa (Pty.) Ltd.	A. E. O'Dowd.
Falks Electrical Supplies (S.A.) (Pty.) Ltd.	V. A. J. Brink.
W. T. Glover & Co. Ltd.	W. J. G. Emery.
Henley's (S.A.) Telegraph Works Co. Ltd.	R. W. Lord.
Hubert Davies & Co. Ltd.	J. W. Webb.
International Combustion Africa Ltd.	G. R. Usher, Q. R. Nothard.
Johnson & Phillips South Africa (Pty.) Ltd.	E. W. Dixon, F. H. Tyler.
Metropolitan-Vickers South Africa (Pty.) Ltd.	J. Monks.
Harold Marthinusen & Co. (Pty.) Ltd.	G. Roeske.
Mitchell Engineering Group South Africa (Pty.) Ltd.	A. E. Wooll.
North & Robertson (Pty.) Ltd.	W. D. Robertson.
C. A. Parsons & Co., (S.A.) (Pty.) Ltd.	T. R. Strawson.
Rice & Diethelm Ltd.	T. F. Suttie, O. M. Robson.
Reunert & Lenz Ltd.	E. J. McKechnie, C. F. Robinson.
A. Reyrolle & Co.	W. J. Gibbons.
South African General Electric Co. (Pty.) Ltd.	E. Crole.
Shell Company of South Africa Ltd.	G. Phillips, I. J. Leng.
Stewarts & Lloyds of South Africa Ltd.	T. A. Robinson, R. Burns.
Southern African Cable Makers' Association	E. B. Sidney.
South African Electrical Review	W. N. Stevens-Burt.

Simplex Electric Co. (S.A.) (Pty.) Ltd.	J. Morrison.
Stamcor (Pty.) Ltd.	J. M. Taylor.
Standard Telephones and Cables Ltd.	W. Joubert.
Scottish Cables (South Africa) Ltd.	A. C. Grant, D. G. Sutherland.
Wilson & Herd Ltd.	G. M. Marshall.
Yarrow (Africa) (Pty.) Ltd.	H. D. T. Harris, G. S. Brown.

LADIES

Mrs. L. G. Axe, Johannesburg.
Mrs. G. S. Brown, Glasgow.
Mrs. R. V. Bailey, Edenvale.
Mrs. E. L. Buchanan, Louis Trichardt.
Mrs. D. A. Bradley, Port Elizabeth.
Mrs. C. R. Burton, Kimberley.
Mrs. J. D. C. Baxter, Kimberley.
Mrs. F. C. Castelyn, Bloemfontein.
Mrs. J. S. Craig, Greytown.
Mrs. D. J. R. Conradie, Bloemfontein.
Mrs. C. L. de Beer, Johannesburg.
Mrs. C. G. Downie, Cape Town.
Mrs. S. de V. de Villiers, Robertson.
Mrs. J. C. Downey, Springs.
Mrs. J. G. F. Erikson, Estcourt.
Mrs. G. A. Fichardt (Mayoress), Bloemfontein.
Mrs. K. M. Fisher, Bethlehem.
Mrs. J. C. Fraser, Johannesburg.
Mrs. L. Futcher, Kempton Park.
Mrs. C. J. Fourie, Potchefstroom.
Mrs. W. J. Gibbons, Johannesburg.
Mrs. A. C. Grant, Johannesburg.
Mrs. D. Haig-Smith, Middelburg, Cape.
Mrs. C. R. Hallé, Pietermaritzburg.
Mrs. K. M. Johnston, Johannesburg.
Mrs. Morton Jaffray, Salisbury.
Mrs. M. N. Kirberger, Bethal.
Mrs. M. J. Kruger, Port Alfred.
Mrs. T. Kramer, Potchefstroom.
Mrs. C. Kinsman, Durban.
Mrs. G. A. Lotter, Aliwal North.
Mrs. C. Lombard, Germiston.
Mrs. H. Laver, Middelburg, Tvl.
Mrs. G. J. Muller, Bloemfontein.
Mrs. M. J. Moolman, Estcourt.
Mrs. W. H. Muller, Port Alfred.
Mrs. A. P. Malherbe, Robertson.
Mrs. J. H. P. Milne, Springs.
Mrs. R. C. Mackay, Somerset West.
Mrs. R. Mercer, Worcester.
Mrs. H. M. S. Muler, Upington.
Mrs. G. C. Molyneux, Bulawayo.
Mrs. Q. R. Nothard, Johannesburg.
Mrs. W. L. Newmarch, Greytown.
Mrs. N. A. Potgieter, Middelburg, Tvl.
Mrs. A. M. Pretorius, Parys.
Mrs. E. de C. Pretorius, Stellenbosch.
Mrs. O. M. Robson, England.
Mrs. A. Rossler, Cradock.
Mrs. H. L. Richardson, Durban.
Mrs. J. H. Rogers, Fort Beaufort.
Mrs. W. Rossler, Kroonstad.
Mrs. T. R. Strawson, Johannesburg.
Mrs. D. G. Sutherland, Pietermaritzburg.
Mrs. J. J. Schoeman, Alberton.
Mrs. A. R. Sibson, Bulawayo.
Miss S. D. Sibson, Bulawayo.
Mrs. R. M. O. Simpson, Durban.
Mrs. F. Stevens, Kimberley.
Mrs. E. E. Sharp, Cape Town.
Mrs. A. T. Taylor, Johannesburg.
Mrs. F. J. Theron, Kroonstad.
Mrs. H. T. Turner, Umtali.
Mrs. G. C. Theron, Vanderbijl Park.
Mrs. P. N. Vickerman, Johannesburg.
Mrs. H. G. Val Davies, Johannesburg.
Mrs. P. L. Vergottini, Brakpan.
Mrs. J. T. Williams, Pretoria.
Mrs. G. Williams, Johannesburg.

LIST OF MEMBERS AS AT 31st MAY, 1954

HONORARY MEMBERS

Dobson, Dr. J. H., 35 Central Avenue, Illovo, Johannesburg.
Eastman, H. A. Torwood, Parel Vallei, Somerset West, C.P.
Horrel, L. L., 139 Brook Street, Brooklyn, Pretoria.
Kinsman, C., 7 Highgate Place, Durban North.
Poole, E., 3 Musgrave Mansions, 690 Musgrave Road, Durban.
Rodwell, A. T., "Miranda," Oxford Road, Parktown, Johannesburg.

COUNCIL MEMBERS

Adelaide, C.P., Municipality, P.O. Box 38.
Aliwal 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., Vilage 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.
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.
George, C.P., Municipality, P.O. Box 28.
Grahamstown, C.P., City Council, P.O. Box 176.
Greytown, Natal, Borough, P.O. Box 71.
Gwelo, S.R., Municipality, P.O. Box 278.
Graaff-Reinet, C.P., Municipality, P.O. Box 71.
Germiston, Tvl., City Council, P.O. Box 145.

Harrismith, O.F.S., Municipality, P.O. Box 43.
Heidelberg, Tvl., Municipality, P.O. Box 201.

Johannesburg, 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.
Komgha, C.P., Municipality, P.O. Box 21.
Kempton Park, Tvl., Municipality, P.O. Box 13.

Ladysmith, Natal, Borough, P.O. Box 29.
Louis Trichardt, Tvl., Municipality, P.O. Box 96.
Livingstone, N.R., Municipality, P.O. Box 29.
Ladybrand, O.F.S., P.O. Box 64.

Mafeking, Bech'd., Municipality, P.O. Box 42.
Matatiele, 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.
Potgietersrust, 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-Maraisburg, Tvl., Municipality, P.O. Box 217, Roodepoort.
Rustenburg, Tvl., Municipality, P.O. Box 16.

Salisbury, S.R., City Council, P.O. Box 990.
Somerset East, C.P., Municipality, P.O. Box 21.
Springs, Tvl., Town Council, P.O. Box 45.
Springfontein, O.F.S., Municipality, P.O. Box 10.
Stanger, Natal, Borough, P.O. Box 72.
Stellenbosch, C.P., Municipality, P.O. Box 17.
Somerset West, C.P., Municipality, P.O. Box 19.
Standerton, Tvl., Municipality, P.O. Box 66.
The Strand, C.P., Municipality, P.O. Box 3.
Theunissen, O.F.S., Municipality, P.O. Box 8.
Uitenhage, C.P., Municipality, P.O. Box 45.
Umtata, Tembuland, Municipality, P.O. Box 57.
Umtali, S.R., Municipality, P.O. Box 121.
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, Town Hall, Walmer.
Winburg, O.F.S., Municipality, P.O. Box 26.
Windhoek, S.W.A., Municipality, P.O. Box 59.
Willowmore, C.P., Municipality, P.O. Box 15.
Worcester, C.P., Municipality, P.O. Box 37.
Wepener, O.F.S., Municipality, P.O. Box 31.
Westonaria, Tvl., Municipality, P.O. Box 19.
Welkom, O.F.S., Village Board, P.O. Box 215.

ENGINEER MEMBERS

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.
Barrat, V. E. O., Municipal Electrical Engineer, P.O. Box 113, Queenstown, C.P.
Bechler, P., Town Electrical Engineer, P.O. Box 43, Harrismith, O.F.S.
Bradley, D. A., City Electrical Engineer, P.O. Box 369, Port Elizabeth, C.P.
Brown, D. D., Municipal Electrical Engineer, P.O. Box 217, Roodepoort, Tvl.
Barton, R. W., Electrical Engineer, P.O. Box 20, Welkom, O.F.S.
Buchanan, E. L., Town Electrical Engineer, P.O. Box 96, Louis Trichardt, Tvl.
Cherry, J. R., Municipal Electrical Engineer, P.O. Box 139, Randfontein, Tvl.
Coetzee, F. J., Municipal Electrical Engineer, Municipal Offices, Wolmaransstad, 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 Wet, D. P., Municipal Electrical Engineer, P.O. Box 15, Willowmore, C.P.
De Wit, 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.
De Villiers, S. de V., Municipal Electrical Engineer, P.O. Box 52, Robertson, C.P.
Erikson, J. G. F., Borough Electrical Engineer, P.O. Box 15, Estcourt, Natal.
Fainsinger, G. S., Municipal Electrical Engineer, P.O. Box 59, Windhoek, S.W.A.
Fisher, K. M., Municipal Electrical Engineer, P.O. Box 551, Bethlehem, O.F.S.
Foden, A., City Electrical Engineer, P.O. Box 529, East London, C.P.
Fraser, J. C., General Manager, Electricity Department, P.O. Box 699, Johannesburg, Tvl.
Futcher, L., Municipal Electrical Engineer, P.O. Box 13, Kempton Park, Tvl.
Gericke, J. M., Municipal Electrical Engineer, P.O. Box 99, Klerksdorp.
Giles, P. A., Assistant City Electrical Engineer, P.O. Box 529, East London, C.P.
Grandin, P. C., Municipal Electrical Engineer, P.O. Box 114, Gatooma, S.R.
Gripper, H. J., Assistant City Electrical Engineer, P.O. Box 369, Port Elizabeth, C.P.
Hadfield, A. W. K., Town and Electrical Engineer, P.O. Box 278, Gwelo, S.R.
Halliday, K. W. J., Municipal Electrical Engineer, P.O. Box 5, Port Shepstone, Natal.
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.
Hattingh, J. D., Municipal Electrical Engineer, P.O. Box 12, Bothaville, O.F.S.
Hugo, D. J., City Electrical Engineer, P.O. Box 423, Pretoria, Tvl.
Haig-Smith, Municipal Electrical Engineer, P.O. Box 55, Middelburg, C.P.
Hatwich, A. H. J., Town and Electrical Engineer, P.O. Box 13, Dewetsdorp, O.F.S.
Heunis, G. B., Town and Electrical Engineer, P.O. Box 66, Standerton.
Hafele, C. F., Deputy City Electrical Engineer, P.O. Box 288, Bloemfontein.
Inglis, J. I., Town Electrical and Water Engineer, P.O. Box 111, Pietersburg, Tvl.
Iverach, J., City Electrical Engineer, P.O. Box 176, Grahamstown, C.P.
Jones, G. E. H., Municipal Electrical Engineer, P.O. Box 42, Mafeking, Bechuanaland.
Kane, R. W., Assistant General Manager, Electricity Department, P.O. Box 699, Johannesburg.
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.
Leishman, R., Chief Engineering Assistant, Electricity Department, P.O. Box 699, Johannesburg.
Lategan, J. F., Town Electrical Engineer, P.O. Box 201, Heidelberg, Tvl.
Lees, D., Town Electrical Engineer, P.O. Box 45, Benoni, Tvl.
Lombaard, C., City Electrical Engineer, P.O. Box 145, Germiston, Tvl.
Lotter, G. A., Municipal Electrical Engineer, P.O. Box 206, Aliwal North, C.P.
Lyall, R. R., Municipal Electrical Engineer, P.O. Box 45, Nelspruit, Tvl.
Macques, J. A., Municipal Electrical Engineer, P.O. Box 42, De Aar, C.P.,
Mathews, J. A., Municipal Electrical Engineer, P.O. Box 45, Uitenhage, C.P.
Meintjies, P. A., Municipal Electrical Engineer, P.O. Box 16, Rustenburg, Tvl.
Millen, T. J., Municipal Electrical Engineer, P.O. Box 23, Nigel, Tvl.
Milln, 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.
Mocke, T. M., Town and Electrical Engineer, P.O. Box 23, Piet Retief, Tvl.
Muller, G. J., City Electrical Engineer, P.O. Box 288, Bloemfontein, O.F.S.
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.
Odendaal, M. W., Town Electrical Engineer, P.O. Box 4, Alberton, Tvl.
Potgieter, N. A., Municipal Electrical Engineer, P.O. Box 14, Middelburg, Tvl.

ENGINEER MEMBERS—(Continued)

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., Municipal Electrical Engineer, P.O. Box 5, Postmasburg, C.P.
Roberts, L. J., Municipal Electrical Engineer, P.O. Box 35, Matatiele, E.G.
Rogers, J., Municipal Electrical Engineer, P.O. Box 36, Fort Beaufort, C.P.
Roode, L., Town and Electrical Engineer, P.O. Box 34, Potgietersrust, Tvl.
Rossler, A., Municipal Electrical Engineer, P.O. Box 24, Cradock, C.P.
Rossler, W., Town Electrical Engineer, P.O. Box 302, Kroonstad, O.F.S.
Rush, W., Borough Engineer, P.O. Box 57, Vryheid, Natal.
Rozendal, D., Municipal Electrical Engineer, P.O. Box 31, Wepener, O.F.S.
Rothman, J. L., Municipal Electrical Engineer, P.O. Box 116, Ficksburg, O.F.S.
Sibson, A. R., City Electrical Engineer, P.O. Box 1803, Bulawayo, S.R.
Sims, C. N., Municipal Electrical Engineer, P.O. Box 3, The Strand, C.P.
Smith, E. L., Municipal Electrical Engineer, P.O. Box 215, Boksburg, Tvl.
Stevens, F., City Electrical Engineer, P.O. Box 194, Kimberley, C.P.
Simpson, R. M. O., City Electrical Engineer, P.O. Box 147, Durban, Natal.
Stocks, E. R., Municipal Electrical Engineer, P.O. Box 25, Mossel Bay, C.P.
Thackwray, W. G., Town Electrical Engineer, P.O. Box 8, Kokstad, E.G.
Theron, W. C., Municipal Electrical Engineer, P.O. Box 37, Worcester, C.P.
Turner, H. T., Town and Electrical Engineer, P.O. Box 121, Umtali, S.R.
Turnbull, A. F., Town Electrical Engineer, P.O. Box 35, Vereeniging, Tvl.
Van der Walt, J. L., Town Electrical Engineer, P.O. Box 94, Krugersdorp, Tvl.
Van der Spuy, J., Town Electrical Engineer, P.O. Box 21, Odendaalsrus, O.F.S.
Vergottini, P. L., Municipal Electrical Engineer, P.O. Box 15, Brakpan, Tvl.
Verschoor, D. R., Town and Electrical Engineer, P.O. Box 36, Butterworth, C.P.
White, J. H., Municipal Electrical Engineer, P.O. Box 197, N'Dola, N.R.
Wilson, J., Assistant City Electrical Engineer, P.O. Box 423, Pretoria, Tvl.
Woolridge, W. E. L., Town Electrical Engineer, P.O. Box 24, Harding, Natal.
Williams, A. H., Assistant Electrical Engineer, P.O. Box 45, Springs, Tvl.
Waldron, F. R., Municipal Electrical Engineer, P.O. Box 57, Umtata, Tembuland.

ASSOCIATES

Andrew, W. M., c/o E.S.C., P.O. Box 667, East London, C.P.
Ashley, T. P., Electricity House, P.O. Box 1803, Bulawayo, S.R.
Burton, C. R., 54 Memorial Road, Kimberley, C.P.
Campbell, A. R., P.O. Box 584, Johannesburg.
Clinton, J. S., P.O. Box 4648, Johannesburg.
Coulthard, R. D., "Hadleydene," 98 Jesmond Road, Pietermaritzburg, Natal.
Conradie, D. J. R., P.O. Box 1009, Bloemfontein, O.F.S.
Dalton, G. A., 111 Eckstein Street East, Observatory Extension, Johannesburg, Tvl.
Dawson, C., Electricity Supply Commission, P.O. Box 2408, Durban.
Ewer, Col. G. G., 174 Edmonds Road, Durban, Natal.
Ferreira, N., Town Engineer, P.O. Box 21, Sasolburg, O.F.S.
Foley, C. B., c/o Electrical Engineer, P.O. Box 35, Vereeniging, Tvl.
Gyles, J. H., "Bodriggy," 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.
Marchand, B., P.O. Box 223, Witbank, Tvl.
Mercier, G., P.O. Box 377, Salisbury, S.R.
Milton, W. H., P.O. Box 1091, Johannesburg.
Mole, E. W., P.O. Box 3386, Johannesburg.
Muller, H. M. S., P.O. Box 112, Upington, C.P.
McDonald, F. G., P.O. Box 74, Pietermaritzburg, Natal.
McGibbon, J., Assistant Electrical Engineer, P.O. Box 197, Ndola, N.R.
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.
Simpson, H. G., Engineering Department, Searles Ltd., Great Brak River, C.P.
Theron, G. C., P.O. Box 1, Vanderbijl Park, Transvaal.
Tubb, B. H. 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.
Williams, V. E., c/o Merz & McLellan, P.O. Box 606, Kimberley, C.P.
Wylie, R. J. S., c/o E.S.C., Rand Undertaking, P.O. Box 103, Germiston, Tvl.

THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

AGENDA and PROGRAMME

28th ANNUAL CONVENTION
held in the
CITY HALL, BLOEMFONTEIN
from the
11th to 14th MAY, 1954

AGENDA OF 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 Secretary and Treasurer.

(5) Retiring President's Valedictory Address.

(6) Presidential Address.

(7) Reports of Sub-Committees and Representatives.
- (i) World Power Conference (Local Committee).
- (ii) Electrical Wiremen's Registration Board.
- (iii) Electrical Wiremen and Contractors Legislation Committee.
- (iv) S.A. Bureau of Standards.
- (v) Meter Testing Code.
- (vi) Wiring Regulations Committee.
- (vii) Overhead Lines Code of Practice.
- (viii) Coal Supplies.
- (ix) Safety Precautions Committee.
- (x) Tariffs Survey Committee.
- (xi) Recommendations Committee for New Electrical Commodities.
- (xii) Representations Committee.
- (xiii) Amendments to Constitution.

(8) Appointment of Auditors.

(9) General.

DIE VERENIGING VAN MUNISIPALE ELEKTRISITEITSONDERNEMINGS VAN SUIDELIKE AFRIKA

AGENDA en PROGRAM

vir die
28e JAARKONVENSIE
wat gehou was van
DINSDAG, 11 MEI tot VRYDAG, 14 MEI 1954
in die
STADSAAL BLOEMFONTEIN

ALGEMENE JAARVERGADERING AGENDA

(1) Verkiesing van President.

(2) Plek van Samekoms van die 1955-Konvensie.

(3) Verkiesing van Onderpresident, Lede van die Uitvoerende Raad, Onderkomitees en Verteenwoordigers.

(4) Jaarverslag van die Sekretaris-Tesourier.

(5) Afskeidsrede van die Aftredende President.

(6) Die Presidentsrede.

(7) Verslae van Onderkomitees en Verteenwoordigers.
- (i) World Power Conference (Plaaslike Komitee).
- (ii) Raad vir Registrasie van Draadwerkers.
- (iii) Komitee vir Wetgewing insake Draadwerkers en Bedradingskontraktante.
- (iv) Die Suid-Afrikaanse Buro vir Standaarde.
- (v) Metertoetskode.
- (vi) Komitee vir Bedradingsregulasies.
- (vii) Gebruikskode vir Bogrondse lyne.
- (viii) Steenkoolvoorrade.
- (ix) Komitee vir Veiligheidsmaatreëls.
- (x) Komitee vir Tariewe-opname.
- (xi) Komitee vir aanbevelings oor nuwe Elektriese Toerusting.
- (xii) Vertoëkomitee.
- (xiii) Wysiging van die Konstitusie.

(8) Aanstelling van Ouditeure.

(9) Algemeen.

RETIRING OFFICERS

President: J. C. FRASER, Johannesburg.
Vice-President: G. J. MULLER, Bloemfontein).
Past Presidents: A. R. SIBSON, Bulawayo, J. C. DOWNEY, Springs.

Councillor Members: Bloemfontein, Port Elizabeth, Cape Town, Durban, Salisbury, Krugersdorp, Pretoria.

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

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

AFTREDENDE AMPSDRAERS

President: J. C. FRASER, Johannesburg.
Onder-President: G. J. MULLER, Bloemfontein).
Oud-Presidente: A. R. SIBSON, Bulawayo; J. C. DOWNEY, Springs.

Lede—Stadsrade: Johannesburg, Bloemfontein, Port Elizabeth, Kaapstad, Durban, Salisbury, Krugersdorp, Pretoria.

L.W.—Die Stad of Dorp word verkies, en nie afsonderlike Raadslede nie.

Ingenieurslede: D. A. BRADLEY, Port Elizabeth; C. G. DOWNIE, Kaapstad; C. KINSMAN, Durban; J. E. MITCHELL, Salisbury; J. L. VAN DER WALT, Krugersdorp; D. J. HUGO, Pretoria.

MEMBERS OF SUB-COMMITTEES AND REPRESENTATIVES

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

Papers: J. C. FRASER (President), G. J. MULLER (Vice-President), A. R. SIBSON (Immediate Past President).

Wiring Regulations Committee: J. C. DOWNEY (Convenor), G. J. MULLER, C. KINSMAN, J. L. VAN DER WALT, C. G. DOWNIE, J. E. MITCHELL.

Electrical Wiremen and Contractors Legislation Committee: C. G. DOWNIE (Convenor), D. A. BRADLEY, D. J. HUGO.

Tariffs Survey Committee: J. L. VAN DER WALT (Convenor), C. G. DOWNIE, A. R. SIBSON, J. C. DOWNEY, and G. PULIK, Co-opted Member.

Amendments to Constitution and Rules: G. J. MULLER (Convenor), J. C. FRASER, C. KINSMAN.

Recommendations Committee for New Electrical Commodities: D. J. HUGO (Chairman), J. C. FRASER (Vice-Chairman).

Representations Committee: J. C. DOWNEY, J. L. VAN DER WALT, D. J. HUGO, J. C. FRASER.

Representatives:

World Power Conference (Local Committee), J. C. FRASER.

Electrical Wiremen's Registration Board, J. C. FRASER.

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

Overhead Lines Code of Practice, J. C. FRASER, J. L. VAN DER WALT, Alternate.

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

Meter Testing Code, J. L. VAN DER WALT.

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

LEDE VAN ONDERKOMITEES EN VERTEENWOORDIGERS

Steenkoolvoorrade: C. G. DOWNIE (Saamroeper); D. A. BRADLEY; G. J. MULLER; D. J. HUGO.

Referate: J. C. FRASER (President); G. J. MULLER (Onder-president); A. R. SIBSON (Jongste Oud-president).

Bedradingsregulasies: J. C. DOWNEY (Saamroeper); G. J. MULLER; C. KINSMAN; J. L. VAN DER WALT; C. G. DOWNIE; J. E. MITCHELL.

Wetgewing insake Draadwerkers en Bedradingskontraktante: C. G. DOWNIE (Saamroeper); D. A. BRADLEY; D. J. HUGO.

Tariewe-opname: J. L. VAN DER WALT (Saamroeper); C. G. DOWNIE; A. R. SIBSON; J. C. DOWNEY; G. PULIK—Johannesburg gekoopteerde lid.

Wysiging van Konstitusie: G. J. MULLER (Saamroeper); J. C. FRASER; C. KINSMAN.

Aanbevelings oor Nuwe Elektriese Toerusting: D. J. HUGO (Voorsitter); J. C. FRASER (Ondervoorsitter).

Vertoëkomitee: J. C. DOWNEY; J. L. VAN DER WALT; D. J. HUGO; J. C. FRASER.

Verteenwoordigers:

World Power Conference (Plaaslike Komitee), J. C. FRASER.

Vir Draadwerkers Registrasieraad, J. C. FRASER.

Steenkool-toekenningskomitee, C. G. DOWNIE, D. J. HUGO Alt.

Gebruikskode vir Bogrondse lyne, J. C. FRASER, J. L. VAN DER WALT Alt.

Komitee vir Veiligheidsmaatreëls, J. C. DOWNEY, J. C. FRASER Alt.

Metertoetskode, J. L. VAN DER WALT.

Suid-Afrikaanse Buro vir Standaarde — Veiligheidskode en ander Komitees, J. C. DOWNEY, J. L. VAN DER WALT Alt.

PROGRAMME

Monday, 10th May, 1954

9.00 a.m. Meeting of Executive Council in Committee Room, City Hall.

Tuesday, 11th May, 1954

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

10.00 a.m. Official Opening of the Convention by The Hon. The Administrator of the O.F.S., Mr. J. J. Fouche.
Election of President.
Venue of next Convention.

10.30 a.m. Refreshment Interval.

11.00 a.m. Address by Sir John Hacking, M.I.E.E., Ex Deputy Chairman (operations) B.E.A.
"Power Production in Great Britain."
Election of Vice-President and Office Bearers.
Retiring President's Valedictory Address.

12.30 p.m. Luncheon adjournment.

2.30 p.m. Convention resumes.
Annual Report of Secretary and Treasurer.
Presidential Address.
Reports of Sub-Committees and Representatives.

3.30 p.m. Refreshment Interval.
Reports of Sub-Committees and Representatives continued.

4.30 p.m. Adjourn.

5.15 p.m. Cocktail Party.

Wednesday, 12th May, 1954

8.30 a.m. Meeting of Executive Council.

9.30 a.m. Convention resumes.
Communications from Council.
Appointment of Auditors.
Paper by P. Wrigley, M.A. (Cantab.), A.M.I.E.E., Salisbury, on "General Distribution Problems."

10.30 a.m. Refreshment Interval.

11.00 a.m. Discussion on Mr. Wrigley's Paper.

12.30 p.m. Luncheon Adjournment.

2.30 p.m. Official Photograph.

3.00 p.m. Tea at City Hall.

3.30 p.m. Buses and other transport depart to Mazelspoort for Braaivleis and folk dancing.

Thursday, 13th May, 1954

8.30 a.m. Meeting of Executive Council.

PROGRAM

Maandag, 10 Mei 1954

9.00 vm. Vergadering van die Uitvoerende Raad, in die Komiteekamer, Stadsaal.

Dinsdag, 11 Mei 1954

9.00 vm. Registrasie, Uitreiking van Referate, ens.

10.00 vm. Amptelike Opening van die Konvensie deur Sy Edele Die Administrateur van die O.V.S., mnr. J. J. Fouche.
Verkiesing van President.
Plek van Samekoms van 1955-Konvensie.

10.30 vm. Pouse. Verversings.

11.00 vm. Rede deur Sir John Hacking, M.I.E.E., Oudvoorsitter (Bedryf) B.E.A., „Power Production in Great Britain."
Verkiesing van Onder-president en Ampsdraers.
Afskeidsrede van die aftredende President.

12.30 nm. Verdaging vir Middagete.

2.30 nm. Konvensiewerksaamhede hervat.
Jaarverslag van die Sekretaris-Tesourier.
Presidentsrede.
Verslae van Onderkomitees en Verteenwoordigers.

3.30 nm. Pouse. Verversings.
Verslae van Onderkomitees en Verteenwoordigers word hervat.

4.30 nm. Vergadering verdaag.

5.15 nm. Skemerparty.

Woensday, 12 Mei 1954

8.30 vm. Vergadering van die Uitvoerende Raad.

930 vm. Konvensiewerksaamhede hervat.
Mededelings van die Uitvoerende Raad.
Aanstelling van Ouditeure.
Referaat deur P. Wrigley, M.A. (Cantab.), A.M.I.E.E., Salisbury, „General Distribution Problems."

10.30 vm. Pouse. Verversings.

11.00 vm. Bespreking van mnr. Wrigley se Referaat.

12.30 nm. Verdaging vir Middagete.

2.30 nm. Amptelike Foto.

3.00 nm. Tee by die Stadsaal.

3.30 nm. Busse en ander vervoer vertrek na Mazelspoort vir 'n Braaivleis en Volkspele.

Donderdag, 13 Mei 1954

8.30 vm. Vergadering van die Uitvoerende Raad.

9.30 a.m. Convention resumes.
Communications from Council.
Paper by C. F. Hafele, B.Sc. (Eng.), A.M.(S.A.), I.E.E., on "Some Design Features of the new Thermal Power Station for the City of Bloemfontein."

10.30 a.m. Refreshment Interval.

11.00 a.m. Engineers' Forum.

12.30 p.m. Luncheon adjournment.

2.30 p.m. Short lecture by the National Occupational Safety Association, and discussion on this lecture.

3.30 p.m. Adjourn.

Friday, 14th May, 1954

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 if business completed.

2.30 p.m. Meeting of Executive Council.

LADIES' PROGRAMME

Tuesday, 11th May, 1954

10.00 a.m. Assemble for official opening of Convention.

10.30 a.m. Refreshments.

11.00 a.m. Annual General Meeting.

Wednesday, 12th May, 1954

2.30 p.m. Official Photograph.

3.00 p.m. Tea at the City Hall.

3.30 p.m. Assemble for transport to Mazelspoort for Braaivleis and Folk Dancing.

Thursday, 13th May, 1954

Bus trip and tea in King's Park.

Friday, 14th May, 1954

10.30 a.m. Assemble for refreshments at City Hall and closing sessions of Convention.

9.30 vm. Konvensieverrigtinge hervat.
Mededelings van die Uitvoerende Raad.
Referaat deur C. F. Hafele, B.Sc. (Eng.), A.M.(S.A.), I.E.E., „Some Design Features of the new Thermal Power Station for the City of Bloemfontein."

10.30 vm. Pouse. Verversings.

11.00 vm. Ingenieursforum—Vrae en antwoorde.

12.30 nm. Verdaging vir Middagete.

2.30 nm. Kort lesing deur die Nasionale Beroepsveiligheidsvereniging.
Bespreking.

3.30 nm. Vergadering verdaag.

Vrydag, 14 Mei 1954

8.30 vm. Vergadering van die Uitvoerende Raad.

9.30 vm. Konvensieverrigtinge hervat.
Mededelings van die Uitvoerende Raad.
Bespreking van Referate en ander besigheid.

10.30 vm. Pouse. Verversings.

11.00 vm. Bespreking van Referate en ander sake voortgesit.

12.30 nm. Konvensie sluit indien sake op die Agenda afgehandel is.

2.30 nm. Vergadering van die Uitvoerende Raad.

PROGRAM VIR DAMES

Dinsdag, 11 Mei 1954

10.00 vm. Vergader vir amptelike opening van die Konvensie.

10.30 vm. Verversings.

11.00 vm. Algemene Jaarvergadering.

Woensdag, 12 Mei 1954

2.30 nm. Amptelike Foto.

3.00 nm. Tee by die Stadsaal.

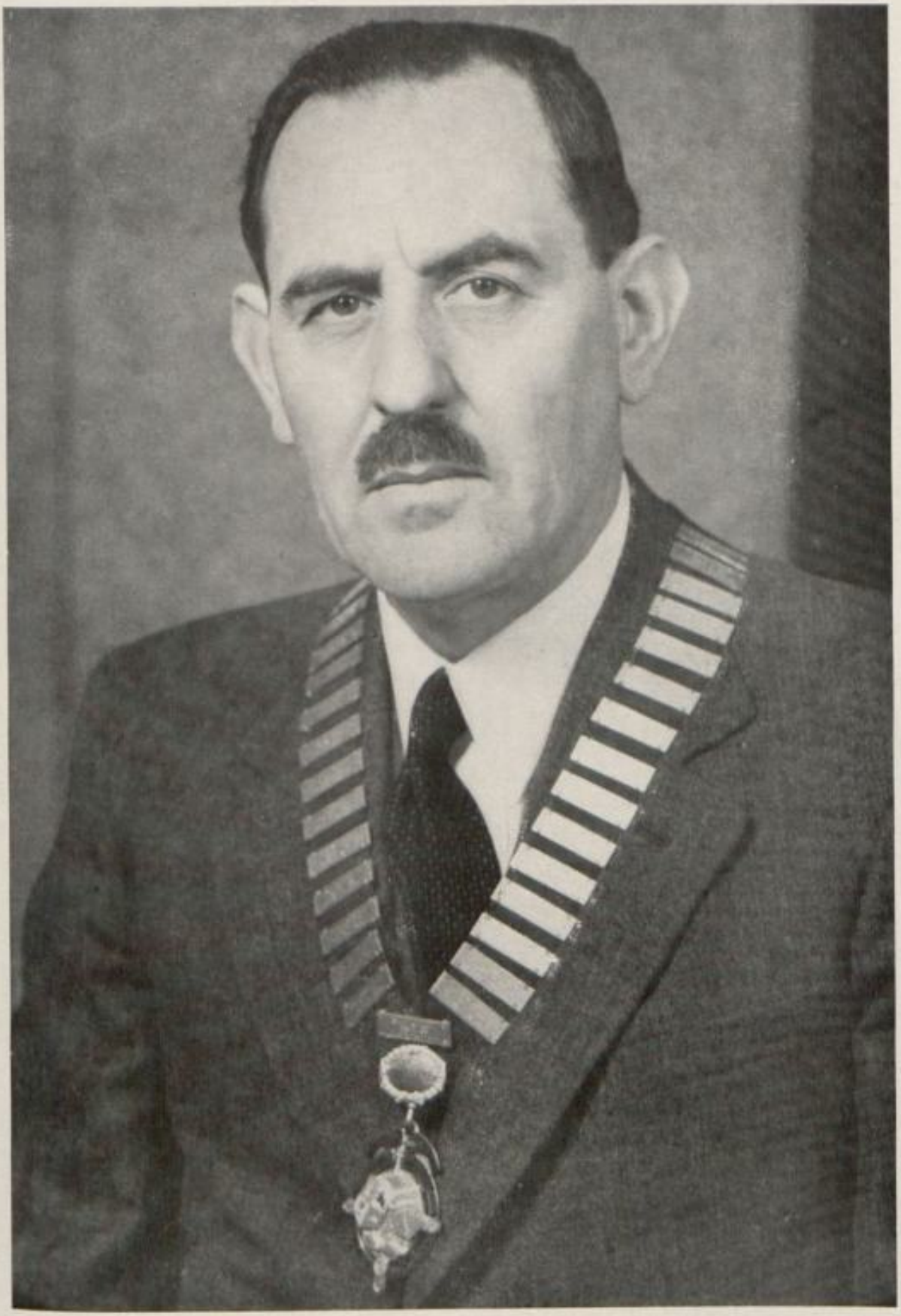
3.30 nm. Vergader vir Vervoer na Mazelspoort vir Braaivleis en Volkspele.

Donderdag, 13 Mei 1954

Bustoer en Tee in Koningspark.

Vrydag, 14 Mei 1954

10.30 vm. Vergader vir Verversings en sluitingsitting van die Konvensie.



G. J. MULLER, Bloemfontein
President, 1954-1955

THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

Proceedings of the Twenty-Eighth Convention, 1954

The Twenty-Eighth Convention of the Association was opened in the City Hall, Bloemfontein, by the Hon. the Administrator of the Free State, Mr. J. J. Fouché, at 10.00 a.m. on Tuesday, 11th May, 1954.

Representatives of 77 Councils attended the Convention including 45 Councillors, 76 Engineer Members, 1 Honorary Member, 9 Associates, 11 Delegates or Representatives of Government Departments, Other Supply Authorities etc., 50 Trade Representatives, 8 other visitors and 68 Ladies — a total of 260.

CIVIC WELCOME

PRESIDENT (Mr. J. C. Fraser, Johannesburg):

Your Worship the Mayor, Your Honour the Administrator of the Free State, Ladies and Gentlemen: It is indeed a pleasure for me to call upon his Worship the Mayor to introduce to this gathering the Administrator of the Free State, Mr. J. J. Fouché.

HIS WORSHIP THE MAYOR OF BLOEMFONTEIN (Councillor G. A. Fichardt):

Mr. President, the Hon. the Administrator, Ladies and Gentlemen: Little did I think a year ago when I attended the Convention in Johannesburg and invited you to hold the next Convention in Bloemfontein, that I would in my present capacity welcome you. I assure you it is a great honour, when I look at this gathering which controls the power of South Africa. I cannot help thinking of Parliament, when I sit in the gallery in the House and look down on those gentlemen on the cushions, I think to myself, what power these gentlemen have that they actually control our destiny. Your Honour, I wonder, if we had to take all these delegates here today and put them in Parliament, how many kilowatts they would produce! You are a very important body to control operating power which, if only cut off for a short while, would cause chaos, and yet it is amazing, how few of us realize it.

"Ons word vertel dat in die Vrystaat Eskom se kragstasie wat teen die einde van 1952 opgerig was, byna net soveel krag ontwikkel as wat die hele Transvaal gebruik. Die gebruik van elektriese stroom neem ook geweldig toe in Bloemfontein.

"Dames en Here, met hierdie paar woorde wil ek u baie hartlik welkom heet in ons Stad, en wil vertrou dat u die tydjie wat u hier in Bloemfontein vertoef, baie sal geniet".

"Mr. President, Ladies and Gentlemen: I would like to take this opportunity now of introducing his Honour, the Administrator of the Free State to you. I do not think it is necessary to say much about him — we all know him and I shall ask him to kindly open this Congress for us. Thank you".

HIS HONOUR THE ADMINISTRATOR OF THE FREE STATE (Mr. J. J Fouché):

Mr. Chairman, Ladies and Gentlemen:

First of all I wish to thank you for the very kind invitation, not only to be present here this morning but also to perform the opening of this congress. Your invitation has made it possible for me to attend this very important congress — for that I sincerely thank you, but when I say *thank you* for the opportunity to address you ladies and gentlemen, I am not equally sincere. I know that electricity plays a most important part — yes a vital role in any modern community, and because of that it is indeed an honour and a privilege to be present at this ceremony and to be able to listen to some of the practical suggestions that will be made during the course of your deliberations by men who

know their subject. The trouble is that I also have to make a speech on this occasion, and ladies and gentlemen my knowledge of electricity can certainly not be classed as "dangerous" when the old saying "a little knowledge is dangerous" is kept in mind, because as far as my knowledge of electricity is concerned, there is not even a little knowledge. To explain to you how little I know about electricity I want to mention this.

At the main entrance to my house there is what I would like to call a treble switch and after many years I am still not able to select the switch controlling a particular light.

Mr. Chairman I now wish to bid every delegate and visitor from beyond the borders of the Orange Free State a very hearty welcome to our province. I hope that your stay will be pleasant and that your deliberations will be most fruitful. Being the centre province it is very often our good fortune to welcome delegates to important congresses, but I can assure you that at the present moment the Orange Free State is so electricity minded that we consider *your* congress as one of the most important and therefore a special word of welcome to you, ladies and gentlemen.

I have just said that I have no knowledge of electricity at all but you know, Sir, *that* after all I cannot be blamed for. I belong to the neglected section as far as the supply of electricity is concerned. I am a farmer by profession Mr. Chairman, and my fellow farmers and myself are expected to supply South Africa with the necessary food and in addition we are expected to supply most of the raw material for an ever growing industrial development and that without any supply of electric power whatsoever.

Farmers are very often criticised for what is called the grandfather methods of farming. They are criticised because they cannot reduce their production costs. It is very often said that farmers speak of over production while there *is* no over production of food stuffs in South Africa. In fact they say that there is a tremendous under consumption, because a very big proportion of the consumers in South Africa cannot afford to pay the present price. We know that is all too true Sir and we realise that it is essential to reduce our production costs but Sir in this age of mechanisation it can only be done if an ample supply of electricity is brought to our farms. On our farms mobile machines will always be in use but we are today using expensive power where electricity could be used. Can we imagine the change that will be brought about on the banks of our many rivers if we had electric power for pumping. Our industries are developing at a wonderful speed but should they be robbed of their electric power and be forced to use the more expensive power that we have to use on our farms, the very same industries will be in a very hazardous position. Electric power is today the very life blood of modern mechanisation and without that power we cannot expect any industry and certainly not the farming industry to obtain an efficient standard.

Mnr. die Voorsitter ons weet dat Suid-Afrika met sy reuse vooruitgang *geweldig* baie kapitaal verteer en dat die voorsiening van elektriese krag groot kapitale koste meebring. Ons besef ook dat kapitaal dwarsdeur die wêreld baie skaars is en daarom sal ek die laaste persoon wees om oordrewe eise vir kapitale beleggings te stel. Ek glo tog dat indien daar die nodige ondersoek ingestel word daar met die voorsiening van elektriese krag groot besparings kan aangebring word en dat daar terselfdertyd baie meer doeltreffende dienste verskaf sal kan word. As Administrateur moet ek daeliks groot lenings goedkeur vir die voorsiening van elektriese krag. Die verskillende munisipaliteite in die Vrystaat moet elkeen aan sy eie gemeenskap krag voorsien. Dit spreek vanself dat elke plaaslike bestuur sy voorsiening van krag so permanent as moontlik moet maak. Daar moet dus 'n geweldige groot hoeveelheid spaar masjinerie en spaardele aangehou word en kan klein munisipaliteite dit nie bekostig om oor te skakel na beter en meer moderne toerusting wanneer hulle ou toerusting uitgeslyt is nie. Hulle moet maar steeds met toetrusting van dieselfde soort aanvul. Indien daar deur die Elektrisiteits-voorsieningskommissie kleiner skemas in ons digter bevolkte dele sou aangepak word, is ek daarvan oortuig dat goed-

Front Row: P. Wrigley (Salisbury); F. P. W. Hall (Somerset West); Cr. R. C. Mackay (Somerset West); ————————; Cr. W. H. Harrison (Johannesburg); C. Kinsman (Durban); J. E. Mitchell (Salisbury); Alderman A. Morton-Jaffray (Salisbury); C. G. Downie (Cape Town); Cr. J. H. P. Milne (Springs); J. C. Downey (Springs); A. R. Sibson (Bulawayo); Cr. C. E. Acton (Pretoria); D. J. Hugo (Pretoria); G. J. Muller (President, Bloemfontein); J. C. Fraser (Johannesburg); Cr. C. E. K. Young (Pietermaritzburg); C. R. Halle (Pietermaritzburg); D. A. Bradley (Port Elizabeth); J. L. van der Walt (Krugersdorp); Cr. M. C. Dames (Krugersdorp); A. T. Taylor (Secretary/Treasurer); Sir John Hacking (England); Lady Hacking (England); Mrs. T. R. J. Bishop (Johannesburg); F. Stevens (Kimberley); J. I. Inglis (Pietersburg).

Second Row: Cr. J. J. Schoeman (Alberton); Mrs. J. J. Schoeman (Alberton); W. N. Stevens-Burt (Johannesburg); G. Phillips (Cape Town); J. Iverach (Grahamstown); J. T. Williams (Pretoria); Mrs. J. T. Williams (Pretoria); ————————; Mrs. J. H. P. Milne (Springs); Mrs. J. C. Downey (Springs); Mrs. J. C. Fraser (Johannesburg); Mrs. C. Kinsman (Durban); Mrs. G. J. Muller (Bloemfontein); Mrs. D. A. Bradley (Port Elizabeth); Mrs. A. Morton-Jaffray (Salisbury); Mrs. A. T. Taylor (Johannesburg); Mrs. Haig-Smith (Middelburg, C.P.); Mrs. J. G. Erikson (Estcourt); J. G. Erikson (Estcourt); G. Roeske (Johannesburg); J. A. Mathews (Uitenhage); E. W. Dixon (Johannesburg); Cr. L. Jawno (Kimberley).

Third Row: P. C. Grandin (Gatooma); W. J. Hill (Johannesburg); P. L. Vergottini (Brakpan); Mrs. W. J. Ebertson (Brakpan); Cr. A. J. E. Holmes (Mafeking); R. L. P. Hattingh (————————); G. A. Lotter (Aliwal North); Mrs. G. A. Lotter (Aliwal North); Mrs. J. D. Hattingh (Bothaville); Cr. H. L. Richardson (Durban); P. A. Giles (East London); Mrs. P. A. Giles (East London); ————————; Mrs. S. de V. de Villiers (Robertson); Mrs. G. C. Theron (Vanderbijl Park); G. C. Theron (Vanderbijl Park); W. J. Gibbons (Johannesburg); Mrs. O. M. Robson (England); O. M. Robson (England); T. F. Suttie (Johannesburg); J. W. Swardt (Pretoria); A. C. Simpson (Walmer); ————————; A. F. Turnbull (Vereeniging).

Fourth Row: C. L. de Beer (Johannesburg); T. R. Strawson (Johannesburg); Mrs. T. R. Strawson (Johannesburg); Mrs. A. C. Grant (Johannesburg); Mrs. C. L. de Beer (Johannesburg); P. W. Joubert (Pretoria); P. H. Newcombe (George); G. E. H. Jones (Mafeking); H. G. Val Davies (Johannesburg); Mrs. H. G. Val Davies (Johannesburg); Mrs. L. G. Axel (Johannesburg); Mrs. T. Kramer (Potchefstroom); Mrs. C. J. Fourie (Potchefstroom); R. W. Barton (Welkom); F. H. Tyler (Johannesburg); V. E. O. Barratt (Queenstown); P. N. Vickerman (Johannesburg); J. Monks (Johannesburg); Mrs. L. Futcher (Kempton Park); L. Futcher (Kempton Park); B. F. J. Jacobs (————————); P. C. Asselbergs (Ermelo); M. N. Kirberger (Bethal); C. R. Burton (Kimberley); T. R. J. Bishop (Johannesburg); S. G. Redman (Johannesburg); Mrs. C. R. Burton (Kimberley); Mrs. J. H. Greeff (Graaff-Reinet); Cr. J. H. Greeff (Graaff-Reinet).

Fifth Row: J. F. Lategan (Heidelberg); J. L. McNeil (Stanger); R. E. G. Andrews (Benoni); E. L. Smith (Boksburg); P. L. Vergottini (Brakpan); Cr. W. J. Ebertson (Brakpan); Cr. M. J. Moolman (Estcourt); Mrs. M. J. Moolman (Estcourt); Mrs. K. M. Johnston (Johannesburg); K. M. Johnston (Johannesburg); Mrs. T. Kramer (Potchefstroom); Cr. C. J. Fourie (Potchefstroom); H. Bahr (Ventersdorp); H. J. Gripper (Port Elizabeth); Cr. R. Mercer (Worcester); N. A. Potgieter (Middelburg, Tvl.); W. H. Milton (Johannesburg); J. A. Macques (De Aar); A. N. Moralee (Bloemfontein); D. Haig-Smith (Middelburg, C.P.); G. A. Dalton (Johannesburg); G. C. Molyneux (Bulawayo); D. Maclennan (————————); H. G. Hampson (Johannesburg); S. de V. de Villiers (Robertson); Cr. H. Thyne (Umtali); H. T. Turner (Umtali).

Sixth Row: W. Budd (Pretoria); D. J. R. Conradie (Bloemfontein); R. M. O. Simpson (Durban); Mrs. R. M. O. Simpson (Durban); Mrs. D. G. Sutherland (Johannesburg); G. B. Heunis (Standerton); Cr. E. J. Smith (Standerton); R. E. Street (Ladysmith); A. Hatwitch (Dewetsdorp); A. C. Grant (Johannesburg); W. Theron (Worcester); E. B. Sidney (Johannesburg); W. Joubert (Johannesburg); H. P. Frick (————————); J. S. Craig (Greytown); Mrs. H. Laver (Middelburg, Tvl.); J. R. Cherry (Randfontein); W. G. Thackwray (Kokstad); J. Rogers (Fort Beaufort); E. T. Peters (————————); T. R. Thomson (Uitenhage); J. W. Ross (Winburg); Mrs. W. Rossler (Kroonstad); W. Rossler (Kroonstad); J. W. Regan (Cape Town); T. A. Robinson (Johannesburg); J. C. van der Walt (Theunissen); E. C. Enfield (Johannesburg); R. T. Park (Port Elizabeth); K. W. J. Halliday (Port Shepstone).

Seventh Row: D. Sutherland (Johannesburg); ————————; J. D. Hattingh (Bothaville); J. W. Webb (Bloemfontein); J. J. Emery (————————); R. N. F. Smit (Pretoria); M. J. Kruger (Port Alfred); J. M. Gericke (Klerksdorp); W. Rush (Vryheid); D. D. Brown (Roodepoort-Maraisburg); J. McGibbon (Ndola); J. Croft (————————); Cr H. Laver (Middelburg, Tvl.); J. C. Strauss (Upington); J. L. Rothman (Vrede); E Pretorius (Stellenbosch); L. Dreyer (Westonaria); J. van der Spuy (Odendaalsrus); F. G. McDonald (Pietermaritzburg); G. A. Marshall (Johannesburg); Cr. H. R. Sissons (Umtata); F. R. Waldron (Umtata); M. J. S. Havenga (Brandfort); V. A. J. Brink (Bloemfontein); Cr. F. J. Theron (Kroonstad); J. R. Wheating (Johannesburg).

koper elektriese krag voorsien kan word. Dit sal ook meebring die gesogte desentralisasie van ons nywerhede met al die voordele daaraan verbonde.

Mnr. die Voorsitter, ek sou graag wou weet hoeveel miljoene in die kragstasies dwarsdeur ons land renteloos staan, as aanvullende masjinerie. Indien daar kleiner sentrale kragstasies opgebou word is dit vanselfsprekend dat daar miljoene ponde aan spaar masjinerie bespaar sal kan word. Toe die Elektrisiteitsvoorsieningswet in 1947 verander is het dit algemene byval gevind maar tot hiertoe het daar nog niks van die kleiner of gesubsidieerde kragsentrales tot stand gekom nie. Ons moet matig met ons eise in Suid-Afrika wees, maar mnr. die Voorsitter, indien atoomkrag nie in die nabye toekoms tot ons redding kom nie, dan sal daar van die veel besproke desentralisasie van ons nywerhede baie weinig tot stand kom. Daar sal dan ook geen sprake van wees dat landbou produksiekoste tot die nodige peil kan daal nie. Dit is onmoontlik met ons hedendaagse duur ingevoerde landbougereedskap en duur ingevoerde brandstof. Atoomkrag moet ons red. Indien dit nie moontlik is nie, sal die broodnodige elektriese krag voorsien moet word en tot hiertoe skyn dit die enigste praktiese weg te wees.

Mr. Chairman as I have said the demand on capital for the supply of services in South Africa is tremendous and with the limited capital it is imperative that priority should be given to certain services. The most important or basic needs should come first. The question is Mr. Chairman have we reached the stage where the supply of electric power to a very much bigger community should be priority No. 1 ? I am not in a position to give an answer to that question. I am not in a position to tell you gentlemen or to tell South Africa what is the best way to supply that power. Will the supply of water power for the generation of electricity be economical in South-Africa or must we rely as in the past on our over abundant supply of coal ? I am not in a position to say whether or not enough investigation has been made overseas as to the best method of supplying rural electric power. When I speak about rural electric power I also include our smaller towns. I am not in a position to say whether it will be possible for smaller communities to co-operate under direction of the Electricity Supply Commission to supply power on a co-operative basis in their vicinity. These and many other questions relating to this subject you gentlemen will be better able to answer. As a layman and Administrator and a farmer I can only feel the growing need for a very much wider supply of electric power. I do hope gentlemen that your deliberations will give birth to ideas which will make the supply of cheaper and above all more electric power possible. In conclusion, gentlemen, I do hope that you will feel perfectly at home in our province.

Dit is nou my voorreg mnr. die Voorsitter om hierdie Kongres as offisieel geopen te verklaar.

PRESIDENT (Mr. J. C. Fraser, Johannesburg):

Your Honour the Administrator of the Orange Free State, Mr. Mayor, Ladies and Gentlemen,

I am sure you will agree with me that we are indeed honoured to have in our midst the Administrator of the Orange Free State, Mr. J. J. Fouché, who has sacrificed valuable time in coming here to open the proceedings of our Convention. We have all enjoyed listening to his very constructive address. He has given our members a great deal of food for thought and as engineers we shall try and answer some of the problems that he has confronted us with. I can assure you, Sir, that we have the answer to many of your problems and as the Administrator of the Orange Free State you also have the answers to many of our problems.

As municipal electrical engineers our efforts are very often curtailed or pigeonholed due to lack of finance and the allocation of finance to municipalities is invariably in the hands of the Administrator.

We would like to accept your challenge and make a deal with you. If we will give you the answers to your ques-

tions and we have satisfied you that it is the correct answer, will you be good enough to open the purse of the Treasury and see that we get adequate finances for our requirements. We thank you very much indeed for your interesting address and for declaring our Convention open.

Mr. Fraser continuing, said that His Worship the Mayor, Councillor Fichardt, is not a stranger to this gathering. Indeed, he has been at many of our Conventions and taken part in our debates. He knows the aims and objects of our Association and has assisted us with many of our problems. He is an engineer, and we are very proud and happy to know that he has now been elected the first citizen of Bloemfontein. I am sure that Bloemfontein will be very much the better off at the end of his year of office. Being an Engineer he understands a good deal of the problems which his City is confronted with.

We wish you, Sir, and the Mayoress Mrs. Fichardt a very happy year of office and we are very pleased, that our Conference has coincided with your year of office.

We thank you very much for coming here this morning and giving us your short address. On behalf of the Convention I wish you all happiness in your year of office.

Ladies and Gentlemen: We will now proceed with the Agenda which is in front of you, and one of my first duties is to call for nominations for President for the ensuing year.

Mr. J. L. VAN DER WALT (Krugersdorp): Mnr. die President, U Edele die Administrateur en u Edelagbare die Burgemeester, Dames en Here: Dit is vir my besonder aangenaam en 'n baie groot voorreg om as ons volgende President voor te stel, iemand wat alom bekend en bemind is. Bemind ja, miskien behalwe deur 'n paar kwaai huisvrouens van Bloemfontein. 'n Persoon na wie ons kan opsien weens sy pligsgetrouheid, sy diensswilligheid en sy vriendelikheid. 'n Persoon wat al baie gedoen het vir hierdie Onderneming en dus ook groot diens aan ons Land gelewer het. 'n Persoon wat alreeds voorheen die posisie as President beklee het en so bewys het wat daar in hom steek. Mnr. die President, ek stel dus voor, mnr. G. J. Muller, stadselektrotegniese ingenieur van hierdie pragtige stad, Bloemfontein, as ons President vir die volgende jaar. (*Applous*).

Councillor M. C. DAMES (Krugersdorp): Mnr. die President, Sy Edele die Administrateur, Sy Edelagbare die Burgemeester, Dames en Here: As 'n verteenwoordiger van die Stadsraad waar mnr. Muller as Ingenieur werksaam was, is dit vir my 'n groot genoeë om hierdie voorstel te sekondeer. Indien mnr. Muller verkies word as President van hierdie Vergadering, is ek seker dat Bloemfontein trots kan wees dat hy nie alleen hulle Elektriese Ingenieur is nie, maar ook as President van die vergadering verkies is, vir die volgende jaar. Ek kan u die versekering gee dat mnr. Muller hom op 'n baie bekwame wyse van sy taak sal kwyt, en ek kan u die versekering gee dat hy natuurlik daardie bekwaamheid besit. Dankie.

PRESIDENT (Mr. J. C. Fraser, Johannesburg): Are there any further nominations? As there are no further nominations, I have the greatest of pleasure in declaring Mr. G. J. Muller, the City Electrical Engineer of Bloemfontein, our President for the ensuing year. (*Applause*).

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

PRESIDENT (Mr. G. J. Muller): The Hon. the Administrator, His Worship the Mayor, Ladies and Gentlemen: The fact that I am standing before you for the second time as your President, makes it no easier for me. This office is always a difficult one and I do hope that with your co-operation I shall be able to keep up the good work of my predecessors.

Baie dankie Dames en Here vir die voorreg om vir die tweede keer as u Voorsitter op te tree.

Ladies and Gentlemen, the next item on our Agenda is the venue of our next Convention in 1955. I believe that Councillor Acton has something to say about this.

Councillor C. E. ACTON (Pretoria): Mnr. die President, Sy Edele die Administrateur van die Vrystaat, Sy Edelagbare die Burgemeester, Dames en Here: Ek bied hierdie Konvensie die groete van die Stadsraad van Pretoria aan, en terselfdertyd, namens my Stadsraad, bied ek u die hartlike uitnodiging om die volgende jaarlikse Konferensie in ons Stad te hou.

Mr. President in extending to you this formal invitation, may I at the same time say that we are appreciative of the fact that you will be our guests next year. I remember well during last year in Johannesburg, Councillor Fichardt, now your worthy Mayor, assuring us that on this occasion of our visit to Bloemfontein, we would receive a welcome in true Free State fashion! I suggest that this is already well under way.

I of course cannot offer you such a welcome — I can only offer you the next best thing, and that is a Transvaal Welcome — (*Applause*) which I heartily do.

Mr. President it is indeed a long time since you held a Conference in our City, and it is then perhaps fitting that you should be invited to do so in the year of our Centenary.

We, in Pretoria, have not been slow to realize the importance of your organization. After all, the public utility which you provide or fulfil, constitutes the life blood of all industrial and other activity, and I say, therefore, that you deserve well of all Local Authorities, because your advancement is consistent with the National Interest, or, should I rather say, the interests of Southern Africa.

I hope, therefore, that it will be in such an atmosphere of co-operation, that we meet in Pretoria, next year.

In anticipation, then, Mr. President, let me end on this note — we are glad you are coming, we will be hopeful of the success of your deliberations and we shall be sorry, indeed, when you leave us. (*Applause*).

PRESIDENT: Ladies and Gentlemen: You have heard Councillor Acton. I do not see any objections raised. May I on your behalf thank Councillor Acton and accept his very kind invitation and ask him to convey to his Council our very hearty thanks, and that we are looking forward to holding our next Convention in Pretoria during their Centenary Year. Thank you very much, Councillor Acton.

PRESIDENT: Ladies and Gentlemen: We will deviate slightly from our Agenda and call for nominations for the post of Vice-President before the tea interval.

Mr. C. KINSMAN (Durban): Mr. President, Your Worship the Mayor, Your Honour the Administrator of the Free State, Ladies and Gentlemen: It is indeed a great privilege for me today to propose as our Vice-President, one who is extremely able but who has so far been able to evade being roped in for such an office. Seeing that the President comes from the Judicial Capital of the Union, it is fitting to have the Vice-President from the Administrative Capital of the Union. There can therefore, be no jealousy between the two. It is also the practice to have the Engineer of the City in which we are going to hold the next Convention, as the Vice-President, and I, therefore have much pleasure in proposing Mr. D. Hugo of Pretoria as our Vice-President for the ensuing year.

PRESIDENT: Will someone please second this proposal.

Mr. C. G. DOWNIE (Cape Town): Ladies and Gentlemen: It is appropriate, I think, that the representative for the legislative Capital of the Union should participate in this rite of electing the Vice-President, as my friend, Mr. D. J. Hugo, happens to be the City Electrical Engineer for the Administrative Capital. I have very great pleasure in seconding the proposal that he be elected to that office. I was interested to learn from Mr. Hugo recently that Pretoria is now selling more kilowatt-hours than we are in Cape Town. Pretoria, of course, has the advantage over us to the extent that they have recently acquired a big customer in Escom's Rand Undertaking! There must also be something about the "quality" of the juice produced in Pretoria because I notice that they can command a higher price for it than we do in Cape Town notwithstanding the fact that we have to pay more than double what Pretoria does for coal! There is some healthy rivalry going on between our two cities in the

matter of Electricity Supply, and there is also that "tug-o-war" still going on between the Legislative Capital and the Administrative Capital, as to which will finally become "The" Capital in both respects. Seeing that this Convention is now being held in Bloemfontein for the second time, I suggest that to settle this argument we meet halfway, i.e. between Pretoria and Cape Town and make it Bloemfontein! At any rate Bloemfontein is the "Capital" for Municipal Electricity Undertakings on this occasion and we look forward to meeting in the Administrative Capital next year when, I understand, Pretoria will be celebrating its Centenary. For that reason also it gives one great pleasure to support Dirk Hugo's nomination as Vice-President for the ensuing year.

PRESIDENT: Any further nominations for Vice-President? If there are no more, I have pleasure in announcing Mr. Hugo as the Vice-President for the ensuing year. Congratulations, Mr. Hugo, will you kindly take your seat on the rostrum.

Mr. D. J. HUGO (Pretoria): Mr. President, your Honour the Administrator, Your Worship the Mayor, Ladies and Gentlemen: All I need say at this stage is, thank you very much indeed for the high honour you have done me and Pretoria in electing me as Vice-President of our organization. In thanking my proposer and seconder, it is unfortunately necessary for me to remind you that Mr. Kinsman is now a politician and, therefore, it is not necessary to take his remarks too seriously. Thank you very much indeed.

PRESIDENT: Ladies and Gentlemen: Just before we adjourn for tea, I have a few announcements to make. It is necessary to know exactly how many of you have your own transport and how many require transport for the outing to Mazelspoort to-morrow. There are ballot boxes in the foyer, and we shall be pleased if those with their own transport, will just use a small chit and advise how many you can take with you. Just fold the chit and place it in the ballot boxes, please.

The other slight omission — actually it is not so slight — is that we omitted to include on the Ladies Programme the Cocktail Party which will be held here this afternoon.

THE AUDIENCE — that is not a slight omission at all!

PRESIDENT: I said it was not so slight actually — anyhow, Ladies, you are cordially invited to attend the Cocktail Party here in this Hall at 5.15 p.m. Then there is another matter — the Mayoress, Mrs. Fichardt has been kind enough to invite the Ladies to their farm, "Brandkop" and she would like you to have tea with her to-morrow morning. Transport will leave from Hoffman Square at 10 o'clock. I do think you will enjoy that.

ADJOURN FOR TEA

PRESIDENT: Before continuing with the work of the Convention, I believe Mr. Bradley of Port Elizabeth has something to say.

Mr. D. A. BRADLEY (Port Elizabeth): Mr. President, Your Honour the Administrator of the Free State, Your Worship the Mayor, Ladies and Gentlemen: We have unfortunately at this Convention to take leave of one of our members, Mr. Clarence Kinsman.

He has given a life time service to the Electricity Supply Industry, particularly that associated with the City Council of Durban, as the City Electrical Engineer, where he was held in high esteem as an eminent Engineer and Administrator. Mr. Kinsman is a Past President of this Association, and has been a member of the Executive Council for some fourteen years. His knowledge, coupled with his wide experience, was much valued, and often used to the advantage of the Association.

Mr. President, with gratitude for Services rendered, I propose that Mr. Kinsman be elected as an Honorary Member of this Association. (*Applause*)

PRESIDENT: Ladies and Gentlemen: I do think it is with your consent that we are now including Mr. Kinsman's name in our roll of Honorary Members.

Mr. Kinsman, we shall miss you very much at the Executive Meetings, but I hope you will visit our next Convention and all the others thereafter. Would you care to say a few words, Mr. Kinsman.

Mr. C. KINSMAN: Mr. President, Your Honour the Administrator of the Free State, Your Worship the Mayor, Ladies and Gentlemen: After giving my best for over 40 years to the electrical industry in this country, there is nothing I value more than the honour you have just done me in electing me as one of your Honorary Members. I do thank you very much, and would like to wish this organization everything of the best. Thank you.

APOLOGIES AND GREETINGS, ETC.

PRESIDENT: We have received several telegrams from absent members, and I would like to ask Mr. Fraser if he would kindly read them out.

Mr. J. C. FRASER (Johannesburg): The following telegrams expressing best wishes for a successful conference were received:

To Secretary:

WISHING CONVENTION EVERY SUCCESS MY QUESTION FOR ENGINEERS FORUM STOP WHY HAVE A CONVENTION WITHOUT ME — ADAMS, OUDTSHOORN.

To City Electrical Engineer:

PLEASE CONVEY APOLOGIES NON ATTENDANCE WISH YOU SUCCESSFUL CONFERENCE AND TERM OF OFFICE — ATTERIDGE, SOMERSET EAST.

To City Electrical Engineer:

BEST WISHES FOR A MOST SUCCESSFUL CONVENTION UNDER YOUR PRESIDENCY — JAMES BEARD.

To the Association:

BEST WISHES FOR SUCCESSFUL CONFERENCE — EASTMAN.

To Secretary:

REGRET UNABLE TO ATTEND THOUGHTS HOWEVER WITH YOU AND TRUST CONFERENCE WILL BE ENJOYABLE AND PROFITABLE MY BEST WISHES TO NEW PRESIDENT AND ALL OLD FRIENDS PLEASE CONVEY MY KIND REGARDS TO ANY OF MY OLD STAFF PRESENT AT CONFERENCE — POWELL.

To City Electrical Engineer:

BEST WISHES TO ALL FOR A SUCCESSFUL CONVENTION REGRET ABSENCE — G. M. REYNEKE, POSTMASBURG.

In addition to the telegrams recorded above, greetings and advise of inability to attend were received from the following:

Council Members: Barberton, Brits, Delmas, Elliot, Eshowe, Ficksburg, Gwelo, Ladybrand, Livingstone, Matatiele, Newcastle, Nigel, Piet Retief, Que Que, Rustenburg, Springfontein, Wepener.

Engineer Members: P. Bechler (Harrismith), G. S. Fainsinger (Windhoek), S. J. Jacobs (Vryburg), R. Leishman (Johannesburg), D. R. Verschoor (Butterworth), W. E. L. Woolridge (Harding).

Honorary Members: E. Poole, A. Rodwell.

Associates: W. M. Andrew, J. S. Clinton, C. Dawson, G. G. Ewer, W. J. F. S. Lutsch, R. J. S. Wylie.

Government Departments and other Institutions: Dr. J. Theo. Hattingh, Chairman Electricity Supply Commission. Chairman, Electricity Supply Commission, Southern Rhodesia. Mr. N. Bertram, Secretary of the Division of Commerce and Industry to the Southern Rhodesia Government. Dr. F. J. de Villiers, Chairman, Fuel Research Institute of South Africa. Chairman, Industrial Development Corporation of South Africa, Limited. Mr. E. R. Savage, President, South African Federated Chamber of Industries. Secretary for Commerce and Industries.

Engineering Firms: Allenwest S.A. (Pty.) Ltd.; Chloride Electrical Storage Coy. S.A. (Pty.) Ltd.; James Howden & Co. Africa (Pty.) Ltd.; George Kent (S.A.) (Pty.) Ltd.; Patrick Murray (Pty.) Ltd.; Power Engineers (Pty.) Ltd.; Rhodesian Cables Ltd.; G. S. Rogers (Pty.) Ltd.; S. A. Porcelain Insulator Manufacturers Association (Pty.) Ltd.; R. T. Urquhart & Co. (Pty.) Ltd.; Waygood-Otis (South Africa) Ltd.

PRESIDENT: Ladies and Gentlemen: We have with us this morning Mr. Richards from the Import Control

Office of the Union. If there are any questions or queries you would like to put to him, he is at your service. He will be in attendance in a room — which will still have to be arranged for. Don't put off your questions, Mr. Richards will be leaving to-morrow and will only be available this afternoon.

Ladies and Gentlemen: We now come to an important feature of this morning. We have been very fortunate in having a visit from Sir John and Lady Hacking. They will be leaving before the end of the Convention as Sir John has other engagements in England, but while in South Africa he has been kind enough to consent to address us this morning.

Sir John has been a leading figure in the electricity supply world for many years, he has been the deputy chairman (operations) of the British Electricity Authority since its inception in 1947. He was an original member of the Organization Planning Committee set up in August 1947 to prepare for the transfer of the British Electricity supply industry to public ownership before his appointment to the Authority.

Before that, he had been since 1934 with the Central Electricity Board, first as Deputy Chief Engineer and later as Chief Engineer. Prior to that date, his early career had been with Merz & McLellan, and while with them travelled extensively in many parts of the world. Included in this work, was the railway electrification in Natal.

Sir John's professional positions have included those of President of the Institution of Electrical Engineers in 1952, President of the British Electrical Power Convention in 1953, President of the British Electrical and Allied Industries Research Association, Vice-President of the British National Committee of the World Power Conference, and a member of the Minister of Fuel's Scientific Advisory Council in the United Kingdom. With this introduction, ladies and gentlemen, I have great pleasure in calling upon Sir John to address this convention.

ADDRESS BY SIR JOHN HACKING, M.I.E.E., Ex-Deputy Chairman (Operations) B.E.A. "Power Production in Great Britain":

Mr. President, Your Worship the Mayor, Your Honour the Administrator, Ladies and Gentlemen, I would first of all like to thank you very much for the invitation to attend this Convention during my visit to the Union, and particularly to express my appreciation for the honour you have done in asking me to address you.

I would like to offer you the good wishes of the British Electrical Power Convention. As you know that is somewhat similar to your own Convention. You have heard something about this organisation before, from Mr. Beard when he visited here last year. I do bring you from that organisation the hearty good wishes for success and prosperity in the future.

I undertook to talk to you for a short time on the general subject of power production in Britain. To be able to appreciate what I have to say it is desirable to go back just a little in the history of electricity supply in Great Britain, and to start with the Electricity Act of 1926 which created the Central Electricity Board.

One of the first duties of this Board was to standardise the frequency throughout the whole of Britain. Thas was a major operation because there were extensive areas in the country which had the frequencies of 40 and 25 cycles and some with other frequencies. It was decided to standardise on 50 cycles, partly because it was the most common used in Britain and also was a European standard.

It was the main duty of the Central Electricity Board to co-ordinate the production of electricity throughout the country and in furtherance of this they prepared construction programmes each year. The maximum new plant installed in any one year before the war, was approximately 770,000 Kilowatts. During the war no new programmes were initiated, but most of the pre-war programmes were allowed to continue.

Before the end of the war it was obvious that there was going to be a grave short-

age of electricity in the post-war years, unless new programmes for additional generating plants were put in hand immediately. During the latter years of the war the C.E.B. made representations accordingly to the Government. The Government at that time decided no doubt quite correctly, not to devote manufacturing resources to any objects other than those which were required for the successful termination of the war.

The shortages did materialize as many of you will know. I would like, however, to refer first of all to the difficulty which occurred in early 1947 which was not due to plant shortage but to coal shortage. What brings it into my mind are the reports in your morning paper that you are faced with a coal shortage, and I would like to tell you something of the consequences of that coal shortage in Britain in 1947. That coal shortage was not unforeseen by the Supply authorities, but the production of coal at that time, was not adequate to meet all demands and the department controlling the coal industry failed to provide the Supply Industry with adequate stock at the beginning of the winter in spite of representations by the Industry. The winter was an exceptionally severe one and by the end of January stocks were depleted to such an extent that stations were having to shut down. It was necessary to reduce the consumption and this was done by cutting off all domestic consumers throughout the country for considerable parts of the day over a period of some two months. More serious, however, was the necessity to shut down major industries in some parts of the country, over a period of several weeks. That serious coal shortage must have cost the country many tens of millions of pounds in industrial production, and I think it is appropriate for me to issue a warning against the serious results which could follow a shortage of coal supplies, for electricity production.

Apart from the coal shortage, in 1948 there were serious plant shortages which involved the dis-connection of supplies at peak periods in the years up to and including 1951/1952. Every effort was made to limit the restrictions to domestic supplies, but it was necessary frequently to extend them to industrial supplies, with grave loss of industrial production.

Although I have stated that this shortage was forseen, its magnitude was greater than anticipated. It was not until the winter of 1952 that reasonable satisfactory conditions were restored, and even now there is the risk of load shedding under extreme winter weather conditions. By the year 1952 the national yearly plant installation had been increased to over 1500 Megawatts, and it is hoped that this will in the next year or two be further increased to 2000 Megawatts per annum.

I would like to refer now to two major differences between British conditions and those in countries like your own. In the first place Britain is a compact little island with a dense population and with load centres relatively close together. The cost of interconnecting these load centres and thereby reducing spare plant capacity is, therefore, lower than it would be if those load centres were more widely separated.

In the second place there is the difference in coal prices. In Britain the average price of coal at the pit was 46/2d. per ton in 1952 and in your country 9/-. The average price delivered to all our stations in the same year was just over 60/- per ton. In your country the maximum price delivered is 40/-. That is at Cape Town, probably the most remote from the coalfields. There is, therefore, a very much greater incentive in Britain to strive for maximum economy of generation.

The interconnecting systems created by the Central Electricity Board operated at 132,000 volts. It was planned on a regional basis and the interconnection between the regions were relatively light and did not provide for full national co-ordination. It was designed 25 years ago and during this period the total demand was increased approximately six times. Considerable re-inforcement had become necessary and the British Electricity Authority decided to construct a new national grid to operate at 275,000 volts and to design this to provide a greater measure of national co-ordination.

This new grid — almost entirely of double circuit construction will run from Glasgow in the north right down to London and the southwest. The northern

section will have a capacity of about 375 mVA per circuit. In the Midlands and between the Midlands and the South heavier conductors are used to provide a capacity of 570,000 KVA per circuit. This is partly because of increased load density but chiefly because the growing coal field from which the electricity supply requirements in the south will be obtained is in the East Midlands area. It is, therefore, proposed to have a greater concentration of generating stations on rivers like the Trent which run through or near this coal field, than would be justified by the load in that area only. There will, therefore, be substantial exports from the Midlands to the South particularly, at off-peak periods. By 1960 it is expected that we shall transmit from the Midlands to the South about one million kW at peak periods and possibly up to two million kW at off-peak periods.

With a total plant installation which by the end of this year will reach 20 million kilo-watts effectively interconnected by the new 275 kV grid there is room for generating units and generating stations of large capacity. Units of 120,000 kW are now being installed and plans are in hand for still larger units of 180,000 to 200,000 kW. Boilers unit with the turbo generators will be used which will have evaporative capacities up to 800,000 lbs. per hour with still larger boilers in prospect. The boilers will be designed for burning pulverized fuel. As at the present time over one third of the coal burned is in this form and by 1960 this proportion will be increased to two thirds. The total plant capacity in some individual sites may, in the not very distant future, be approaching one million kW.

I have, in the short period available to me, given you a very general picture of the British plans for the production of electricity. Time has not permitted me to go into more detail but I hope the general picture will have been of interest.

PRESIDENT: Sir John we are very grateful to you for this address. I would now ask Mr. Fraser to propose a vote of thanks.

Mr. J. C. FRASER (Johannesburg): Mr. President, Ladies and Gentlemen: I am sure you agree with me that we have listened to a most interesting address on the power situation in Great Britain. This is not the first occasion we have been honoured by a prominent engineer from Overseas to address this Convention. You will remember last year, we had the honour of an address by Mr. James R. Beard, the Vice-President of the British Electrical Power Convention.

Sir John has put himself out considerably to be with us at this Convention. I know that his plans were somewhat different before he was approached by us, to address this conference, and we are extremely grateful to Sir John for rearranging his plans so that he could be with us this morning.

I first met Sir John when I was in London in 1951 and I shall never forget the friendly manner in which he received me. He immediately made me feel at home and spent over an hour answering the many questions that I put to him. That sort of treatment is not easily forgotten by an engineer travelling away from home. After all, Sir John held a very high position and was a very busy man and I was very grateful to him for giving that hour of his valuable time.

This morning Sir John has given you an inside picture of some of the difficulties experienced by the British Electricy Authority, and some of the figures in connection with the size of plants that are commissioned overseas will enable us to compare with the stations in South Africa.

On behalf of this Convention we would like Sir John to take back to the British Electricity Power Convention, which is being held shortly, our greetings, and we hope that the Convention will be a great success and we pay tribute to the new President and hope that he will have a very successful year of office. I feel, Ladies and Gentlemen, that the bond between the associates of the Conventions in Great Britain and South Africa is getting closer every year and we hope that one of these days some of our members will have the good fortune to address the British Electricity Power Convention in Great Britain.

On behalf of the gathering here this morning I would like to tell Sir John

and Lady Hacking that we hope the remainder of their stay in this country will be very pleasant and that when they leave the shores of South Africa and get back to their normal abode in Great Britain they will reflect on the many good friends they have made during their stay in South Africa.

In conclusion I again thank Sir John for his interesting address and bid him Godspeed.

PRESIDENT: Thank you Mr. Fraser, I would now ask Mr. Mitchell to kindly second this vote of thanks.

Mr. J. E. MITCHELL (Salisbury): Mr. President, Sir John and Lady Hacking, Ladies and Gentlemen: Last year I had the privilege of proposing the vote of thanks to Mr. Beard, and when Mr. C. G. Downie was called upon to second the vote of thanks, he said: "The proposer has incidentally taken a lot of words out of my mouth, so it makes my task, in seconding the vote of thanks very much shorter, but not quite so easy". Well, I am in the same position now because the President, on introducing Sir John to you, told you mostly everything about him. I was fortunate in having the pleasure of meeting Sir John in Salisbury before this Convention. When I met Sir John in Salisbury, I detected a slight Lancashire accent which I think he has acquired by right of birth, whereas I have acquired my slight Lancashire accent by adoption.

I wonder if you realize that Sir John started right at the bottom, and that is the reason why he fully realizes the problems today. Sir John started as junior District Engineer with the Newcastle Electricity Authority in 1908, which is possibly a little difficult to believe in view of his youthful looks. The R.A.F. during the war had a motto "Per ardua ad astra". In 1948 when Britain decided to nationalize all industries, a number of engineers had a motto, "Illigitimo non carborundum", and the full meaning I unfortunately cannot explain to this gathering, but in a few words it means "Don't let the so and so's grind you down!" (*laughter*). It was with that spirit that a good deal of the industry approached nationalization, and you will realize, therefore, what a victory it was for Sir John to have blended together all the various interests, individuals, companies and Municipalities into what is today a composite and reasonably happy band. I feel if any young engineers of today will base their lives on that of Sir John Hacking, then he will merit the R.A.F. motto previously mentioned.

Sir John, it was indeed a very great honour and privilege for me to be able to second this vote of thanks to you, for giving us this very instructive address.

PRESIDENT: Ladies and gentlemen will you please signify approval in the usual manner (*applause*). His Worship the Mayor has indicated that he must leave the Convention at this stage. We thank you Mr. Mayor and Your Honour the Administrator once more for the honour you have done us today and in giving up your very valuable time this morning.

PRESIDENT: We shall now appoint the office bearers — We have the President, the Vice-President and two immediate past presidents, which are Mr. J. C. Fraser and Mr. A. R. Sibson. We then have six Engineer Members, Messrs. D. A. Bradley, C. G. Downie, C. Kinsman, J. E. Mitchell, J. L. van der Walt and D. J. Hugo. Mr. Hugo as the Vice-President automatically becomes a member of the executive. Can we now have nominations for six Engineer Members on the new executive please.

The following were duly proposed and seconded:—

D. D. Brown, Roodepoort,
C. R. Halle, Pietermaritzburg,
C. Lombard, Germiston,
J. C. Downey, Springs,
J. E. Mitchell, Salisbury,
D. A. Bradley, Port Elizabeth,
C. G. Downie, Cape Town,
R. M. O. Simpson, Durban,
J. L. van der Walt, Krugersdorp.

PRESIDENT: Associates are entitled to vote. The names of the new executive members will be announced after the lunch break.

ADJOURN FOR LUNCH

PRESIDENT: Gentlemen, we are already a few minutes late, so will have to hurry if we want to get through our programme. In the foyer you will find our staff on duty who will assist you with all your little problems etc. If you would like to contact any of our Municipal Undertakings, just get in touch with our staff.

Will those of you who would like to make use of the transport available for the trip to Mazelspoort to-morrow put a chit in the box in the foyer.

There still seems to be some misunderstanding in connection with the ladies programme. The trip to the Mayor's farm is for to-morrow morning and the transport will leave the Hoffman Square at 10 o'clock, and return before 1 o'clock.

In connection with the Import Control — I believe that a few members have already made enquiries. Mr. Richards will be available just after Mr. Fraser has delivered his Valedictory Address, in the committee room — just enquire in the foyer and you will be conducted there.

Gentlemen, I have great pleasure in announcing the following members as being elected to the Executive:—

Messrs. C. G. Downie, Cape Town,
J. C. Downey, Springs,
D. A. Bradley, Port Elizabeth,
J. E. Mitchell, Salisbury,
J. L. v.d. Walt, Krugersdorp,
C. R. Halle, Pietermaritzburg.

My heartiest congratulations to the elected members (*applause*). I notice that they are all old war horses, but I would like to thank those members who were not among the first six to be elected, for the willingness to stand for election, and trust that in due course they will get the opportunity to serve on the Executive (*hear, hear!*).

Gentlemen, we now come to Mr. Fraser's Valedictory Address.

RETIRING PRESIDENT'S VALEDICTORY ADDRESS. By J. C. FRASER, M.I.Mech.E., M.I.E.E., M.(S.A.)I.E.E.:

Mr. President, Ladies and Gentlemen:

As I relinquish the office of President today, I find myself looking back not only on another year of steady progress in South African electricity supply industry, but on the achievements of the industry during my association with it over very nearly half a century.

In little more than fifty years, 250 undertakings have sprung up, 180 or more of which have their own generating plant. In addition to these there are now more than 180 private companies which either generate or distribute electricity on their own account.

Johannesburg was the first to establish a municipal electricity undertaking in 1889, and Cape Town, East London, Durban, Pietermaritzburg and Pretoria followed before the turn of the century. In 1916 there were 36 municipal undertakings and by 1923 there were 48. According to the latest official census there were 2,251,361 kilowatts of generating plant installed in 316 stations in the Union in 1948.

As the number of undertakings and power stations has grown so the size of them has increased proportionately and the problems associated with the running of a large undertaking, particularly those of finance and manpower, have now reached an aspect of national concern.

In the next few minutes or so I should like to review some of these problems, with particular reference to the manner of their growth, their present form and their future trends.

I shall deal with them under two broad headings:—

(1) Plant, equipment and materials, and
(2) Personnel.

(1) *Plant Equipment and Materials*

Along with the increasing demands for more generating plant there has grown a desire for greater efficiency in operation and for compactness and simplicity of control. Big strides have been made overseas in recent years in the design of both generators and boiler plant and these are reflected in the larger installations now appearing in this country.

The largest single generators in South Africa at the moment are the 40 MW sets installed at Congella Power Station but 60 MW sets are on order for other E.S.C.

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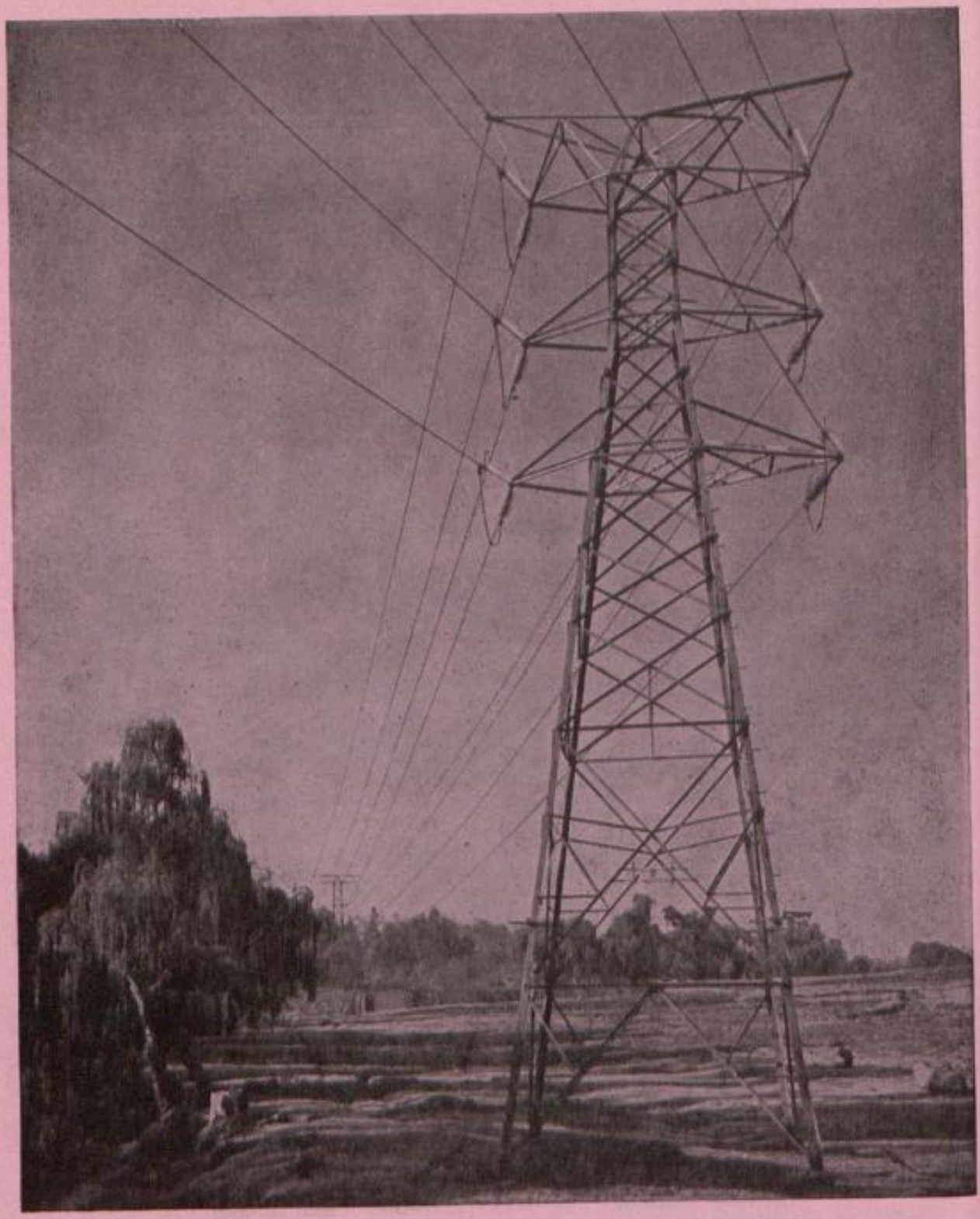

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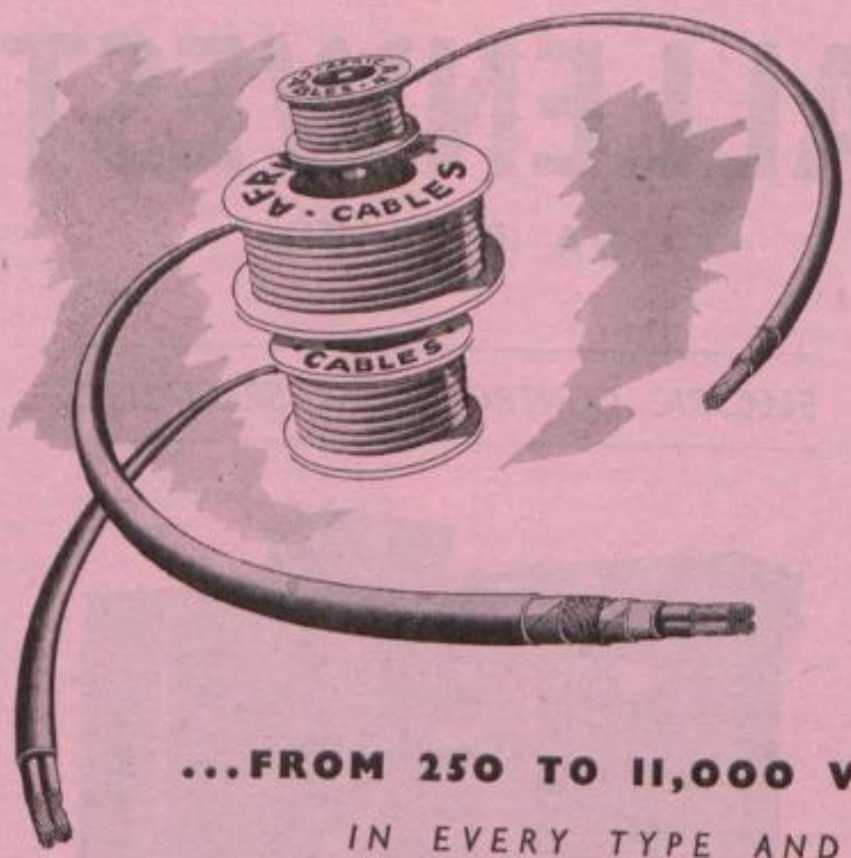

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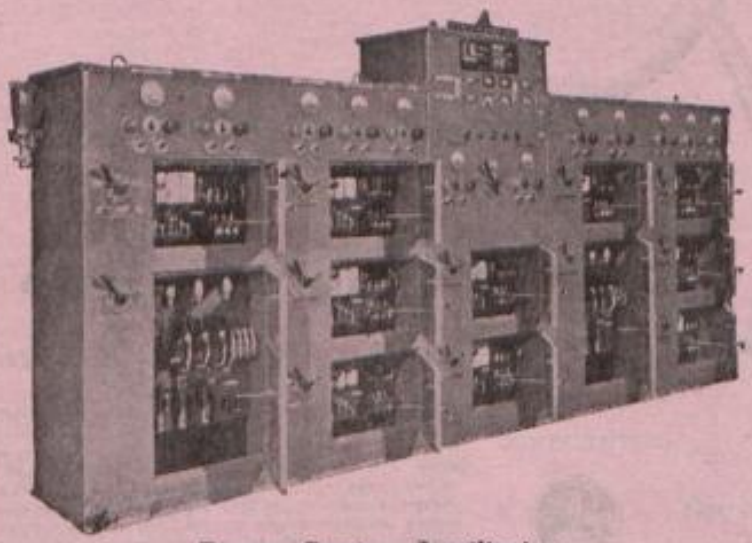

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stations at Taaibos and Wilge. In Britain where a 60 MW unit is quite common, units up to 200 MW are being projected whilst in America a 300 MW unit is under construction. In the quest for higher efficiencies, boiler pressures and temperatures are being stepped up and on the transmission side higher line voltages are being designed.

New equipment such as pulverised fuel fired boilers and air break switchgear are bringing in their wake new problems and techniques. A modern 40 MVA 3 phase transformer weighing 70 tons installed in Johannesburg recently raised quite a problem in transport arrangements, but this is a relatively light unit compared with the 190 MVA transformer weighing 161 tons built in America last year.

Johannesburg is at present installing the first 88 kV oil pressure cable in South Africa. The technique of laying and maintaining this extra high voltage cable has been well established overseas and the benefit of this experience has been passed on to us.

We have seen a minor industrial revolution taking place in the last few years. Financial stringency and import control have made it necessary to manufacture in this country much more electrical equipment than hitherto. Stoves, water, heaters, electric motors, 20 kV cable, transformers, switchboards, to name a few of the more important items, are now made in South Africa from materials, largely of local origin. The quality of these products compares well with overseas standards and the country is rapidly becoming independent of external resources for all items except those requiring highly specialised skills and large scale production methods.

The supply position of raw materials has eased very considerably and consequently deliveries of manufactured goods has tended to improve in recent months.

(2) *Personnel*

Not the least important of all problems arising in the running of a municipal electricity supply department are those connected with the recruitment and training of personnel.

If you ask a candidate for the position of apprentice electrician why he has chosen this particular work as a career you will usually find that he was interested in electricity as a subject at school. The fact that electricity has a fascination of its own and appeals to the imagination of youngsters of today is something for which we must be duly grateful, but with the terrific expansion envisaged in the near future we cannot afford to rely too much on the romantic aspect to supply all our manpower requirements.

GRAPHS

Fig. 1 shows the results of plotting (a) the total installed generating capacity, (b) the total number of employees, native and European, and (c) the total number of European employees only from the year 1927 to 1950 in the Union of South Africa.

The graphs are plotted on a logarithmic scale and it will be seen that those for (a) total installed capacity and (c) total European employees are almost straight until 1939, the beginning of the war, which means that they were increasing at an almost constant compounded percentage each year.

During and after the war restricted deliveries and subsequent shortages of manufacturing capacity and materials reduced the rate of increase of installed capacity to a lower but still constant value.

The effect of the war on the total number of European employees was to reduce them slightly during the period of hostilities, the total at the end of the war being practically the same as at the beginning. After the war the number began to increase again at a somewhat lower rate than before.

If we assume, conservatively, that generating plant will continue to be delivered at the present rate until 1960 we may extend graph 1 (a).

Similarly, to obtain the number of European employees required we may extend graph 1 (c).

It will be seen that in 1960 we will require 15,200 European employees to operate 3,130MW of installed capacity or 4.85 employees per MW. Statistics for 1954 are not as yet published but using

values from the extended graphs it will be seen that we will require an increase of 4,400 European employees between now and 1960 to comply with this trend.

Therefore, ignoring the additional natives required we are faced with an increase of 41% of our present European staffs in the next 6 years and, in addition, a possible replacement of about 15% or 1500 due to retirements, making a total of about 6000 additional European personnel. In a country of the size of South Africa the gravity of this situation is obvious.

In looking for a possible solution to the problem let us refer to Fig. 2(b) which is a graph of European employees per MW of installed capacity. It will be seen that prior to the war the figure dropped gradually to 3.86 in 1938. Due to manpower shortage it dropped still further during the war, then commenced to climb again afterwards. Based on this rate of climb the figure will reach 4.85, as calculated above, in 1960.

There seems little reason to suppose, however, that a figure of 3.86 which was found to be workable once should not again be found workable in the future. If we use the figure 4.0 in our calculations to allow for contingencies the personnel requirements, not including replacement of retired personnel, becomes 1,800. This includes all classes of European personnel employed in electricity undertakings.

The figure of 1,800, as stated, does not include for retirements but this alone amounts to an increase of 18% of present staff and it must be remembered that the European male population of South Africa is increasing by no more than 2.18% per annum or about 14% in 6 years.

Other industruies are endeavouring to expand as well as ours and the competition for manpower will eventually resolve itself into an all out effort to make conditions of employment more attractive, and to improve the efficiency of the available manpower.

Much can be said about improving conditions of employment but it is only necessary to review our own experiences over the past few years to realise that conditions are undergoing a continual change for the better, particularly as Municipalities are not slow in taking advantage of modern methods and equipment. Together with the element of "security", a generally acknowledged though somewhat indefinable commodity, working conditions will always have some attraction for the prospective municipal employee.

The recruitment of power station operatives is giving some cause for concern at the moment. Under present arrangements these men are in the semi-skilled class with no recognised apprenticeship for their trade and with consequently no qualifications to enable them to compete for higher promotion. As a labour force they are unstable and tend to drift with the tide of labour demands.

I feel that, an apprentice training scheme for power station operatives should be inaugurated to encourage young men to take up this work as a career. They should be given the training and the opportunities to enable them to qualify as shift engineers in a power station and thus be assured of a salary and position commensurate with their abilities.

As another means of improving the effectiveness of our labour force and of increasing the skill required to deal with problems arising from the increasing size and technical complexity of our electricity supply systems, I feel that the time has come in this country to follow the lead given overseas in the matter of an exchange scheme of technical personnel. Under this scheme the BEA sends engineers and technicians to France and to Australia in exchange for men in similar positions in their own undertakings. The advantages of the scheme are obvious, it gives opportunities to men of all grades to acquire experience and knowledge of methods employed in other places, to widen their technical outlook and to bring back new ideas and techniques to stimulate progress in their own country.

A scheme like this would not cost very much and the municipal authorities would soon recover the cost in increased efficiency from their employees. A similar scheme could also be applied in this country in a modified form based on an exchange of technical staff between South African electricity undertakings for limited periods with benefit to all concerned.

Apart from any exchange schemes, I would urge municipal authorities in their own interests to allow members of their technical staffs to proceed overseas to study technical developments at municipal expense. This, apart from increasing technical skill available to them, would help in other ways by making municipal service more attractive.

Unfortunately the general trend in these days of financial difficulties is only too often the other way. For instance one often hears of difficulties put in the way of members of this Association by their Councils, when funds to attend this Convention are under consideration, and the suggestion that the Convention should be held biennially instead of every year is recurring frequently.

I think that this attitude is short-sighted. The Association, in nearly 40 years of its existence, has served a very useful purpose and its usefulness is increasing as the difficulties arising from the development in this country are multiplying.

The A.M.E.U. deserves every encouragement and, if given this, will serve the interests of Municipal government in general and Municipal electricity supply in particular, with increasing effectiveness.

In concluding this address I might summarise by saying there are plenty of difficulties looming up ahead of us. I have merely touched on a few of them and have suggested possible solutions here and there. Some of these difficulties will disappear and others will take their place. I do feel, however, that the A.M.E.U. is of great assistance to us in affording the opportunity to air our grouses and grievances and enabling us to sort them out collectively and it is with plenty of optimism that I view the future.

Finally — I would like to express a word of appreciation to the Staff of the Electricity Department, Johannesburg, for their very willing help and co-operation in the preparation of this address.

In addition, there is due to the Members of the Executive Council and Secretary of the Association grateful thanks for the ever ready guidance and assistance afforded me during my term of office as President.

PRESIDENT: I now call upon Mr. Hugo to propose a vote of thanks.

Mr. D. J. HUGO (Pretoria): Mr. President, Gentlemen: I feel highly honoured at being asked to propose a vote of thanks to our Past President for his constructive Valedictory Address.

I like to think that I have been asked to do so because of my close and pleasant association with Mr. Fraser for nearly 25 years and because only Johannesburg now sells more units than Pretoria.

Mr. Fraser's election as President of this Association was in the nature of an anti-climax. In 1944 he was President of the South African Institute of Electrical Engineers — the major Engineering Association in this Country — and he is also a Past President of the Institution of Certificated Engineers. The experience gained in these high offices has been used to the benefit of your Association and on your behalf I express grateful appreciation to our Past President for the great work he has done during the past year.

Mr. Fraser is General Manager of the largest municipal Electricity Undertaking in Southern Africa. During the period he has held that position he has been responsible to his Council for the control of expenditure amounting to tens of millions of pounds. When an engineer with such vast responsibilities and such wide experience looks into the future his predictions cannot lightly be disregarded.

It is not proper for me to discuss the subject matter of Mr. Fraser's address and I shall only say this that Municipal Councils and their Engineers would be well advised to take heed of the warning he gives in regard to the shortage of personnel in the Electricity Supply Industry.

It has long been accepted that the Engineering Profession is the most poorly paid of all professions and inevitably the industry has suffered on this account as the youth of the Country are attracted to the more lucrative professions.

His message is clearly this:- "If you have a good staff adopt every means at your disposal for retaining their services".

Mr. Fraser, thank you for your interesting and constructive address and for what

you have done for the Association during your year of office.

PRESIDENT: I now call upon Alderman Morton Jaffray to second the vote of thanks.

Alderman A. MORTON JAFFRAY (Salisbury): Mr. President, Gentlemen: I am very pleased to have been given the opportunity to second the vote of thanks so ably proposed by Mr. D. J. Hugo. I first met Mr. Fraser at the Salisbury Convention in 1945. He was, I think, new to the executive then. On and off from then until the present day Mr. Fraser has served continuously on the Executive and has throughout that period given us his best. During the past year I have been in the position to see how ably he has done his duty.

We do not know what Mr. Fraser intends doing when he retires later in this year. We only hope that he is also not going to go in for politics. May I suggest that he returns in a consultant capacity so that the smaller undertakings can get the benefit of his advice and experience, all for nothing!

We have said a lot about Mr. Fraser, but Mrs. Fraser I am sure ably supported him and they are a very happy little team. I mentioned I met Mr. Fraser in 1945 in Salisbury, but because of illness Mrs. Fraser was not able to accompany him to that convention. We had another convention in Southern Rhodesia since then and again Mrs. Fraser was not able to visit us as Mr. Fraser was overseas. When we are again in a position to hold a Convention in Salisbury, I hope Mrs. Fraser will be able to accompany Mr. Fraser. We are faced with the lack of hotels — and not finance — but hope that since we have now received federal status, we may get a few more hotels and be able to accommodate you all.

Mr. President, with those few remarks as well as the remarks made by Mr. Hugo, I have much pleasure in seconding the vote of thanks.

PRESIDENT: Thank you very much Alderman Morton Jaffray.

PRESIDENT: If there are any remarks you would like to make on the Valedictory Address, there is still some time before we adjourn for tea. It appears as if there are no comments.

Gentlemen, we still have time before tea for the Secretary's Report, which Mr. Fraser will read.

ANNUAL REPORT

April, 1954.

To the President and Members of the Association.

Gentlemen: I have the honour and pleasure of submitting to you the Annual Report, together with the Revenue and Expenditure Account and Balance sheet for the financial year ended 28th February, 1954.

Obituary

I regret to have to record the passing on of Mr. R. Tarran, ex-Electrical Engineer, Benoni, and Mr. P. D. Kruyt, an Associate and ex-Town and Electrical Engineer, Theunissen.

Twenty-Seventh Convention

The Twenty-Seventh Convention of the Association was held in Johannesburg from Tuesday the 21st to Friday the 24th April, 1953.

The Convention was officially opened by the Honourable the Administrator of the Transvaal, Dr. W. Nicol, and was followed by addresses by Dr. J. T. Hattingh, Chairman, Electricity Supply Commission and Mr. James R. Beard, C.B.E., Vice-President, British Electrical Power Convention.

In all, 366 members, delegates and other visitors attended the Convention.

It is opportune at this stage to express the appreciation and sincere thanks of the President, members of the Association, delegates and visitors to His Worship the Mayor and City Council of Johannesburg for the most enjoyable entertainment provided, the splendid way in which the ladies were looked after, for the facilities made available for holding our meetings and to those officials who assisted in making the stay of visitors in Johannesburg so very pleasant.

Our thanks is also due to the Directors and Staff of the South African Porcelain Manufacturers Association (Pty.) Ltd. for a most enjoyable afternoon spent in touring the works of the Rand Brick,

Pottery and Lime Co., and the S.A. Glazing Co. Ltd. at Olifantsfontein and Boksburg respectively and last but not least for the splendid luncheon provided and later in the afternoon a most enjoyable cocktail party.

Papers

Two papers were presented:-

"Basic Principles of the Construction of Electricity Tariffs" by G. Pulik, Dipl. Eng., A.M.I.E.E., A.M. (S.A.) I.E.E., (Johannesburg Electricity Department) and "Centralized Injection Ripple Control of Water Heaters and Street Lighting in Salisbury" by J. E. Mitchell, B.Sc. (Tech.) Hons., M.I.E.E., M.I.Mech.E., City Electrical Engineer, Salisbury.

These papers were very well received and resulted in a great deal of discussion.

Engineer's Forum

The Engineer's Forum was introduced for the first time at this Convention and proved a great success and resulted in a good deal of discussion in which Councillors took the opportunity of taking part.

1954 Convention

An invitation received at the Johannesburg Convention from the City Council of Bloemfontein to hold the Twenty-Eighth Convention in that City was unanimously accepted.

Membership

The following new members were elected during the period 1st March, 1953, and 28th February, 1954.

Council Members

De Aar and Postmasburg, Cape Province and Dewetsdorp and Welkom Village Board, O.F.S.

Engineer Members

D. Haig-Smith, Electrical Engineer,, Middelburg, C.P.

Ad. Hatwich, Electrical Engineer, Dewetsdorp.

G. B. Heunis, Town Electrical Engineer, Standerton.

D. Lees, Town Electrical Engineer, Benoni.

J. A. Macques, Electrical Engineer, De Aar.

M. W. Odendaal, Town Electrical Engineer, Alberton.

J. L. Rothman, Town Electrical Engineer, Vrede.

R. M. O. Simpson, City Electrical Engineer, Durban.

Transfer from Associate to Engineer Membership

D. R. Milln, Town Engineer, Fort Jamieson.

F. R. Waldron, Electrical Engineer, Umtata.

Transfer from Engineer Membership to Associate

J. McGibbon, Assistant Electrical Engineer, N'dola.

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

R. J. S. Wylie, P.O. Box 103, Germiston.

The comparative figures of membership for the years 1952/53 and 1953/54 are:-

	1952/3	1953/4
Councils	103	107
Engineer Members	97	100
Hon. Members	5	5
Associates	37	34

Appeal to Engineer Members

As I have recently found that Engineer Members have changed their employment and it has only been by chance that after the lapse of a considerable period that I have ascertained this, I must once again strongly appeal to members when changing their occupation or address to notify the Secretary of such change, so as to facilitate keeping in touch with them and keeping a proper record of Members.

Financial

It is pleasing to be able to report that the Association's financial position is sound.

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

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

I remain,

Mr. President and Gentlemen,

Yours faithfully,

A. T. TAYLOR,

Secretary/Treasurer.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA
BALANCE SHEET — 28th FEBRUARY, 1954

1953					1953			
£2,478	*Accumulated Funds*		£2,812	2 10	£ 1	*Presidential Badge*	1	0 0
	Balance at 28th February, 1953	2,477 11 6				Nominal Valuation		
	Add: Excess of Income over Expenditure for year ended 28th February 1954	334 11 4			64	*Furniture and Fittings* At cost less depreciation	57	10 0
					2,114	*Investments*	2,255	2 4
—	*Subscriptions Paid in Advance*		4	4 0		Fixed Deposits at United Building Society including interest accrued	23	14 0
1	*Creditor*				29	*Debtors*	479	0 6
					271	*Cash at Bank and On Hand*		
			£2,816	6 10			£2,816	6 10
£2,479					£2,479			

President: J. C. FRASER.

Secretary/Treasurer: A. T. TAYLOR.

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

We report that we have examined the above balance sheet with the books and vouchers of the Association for the year ended 28th February, 1954; that we have satisfied ourselves of the existence of the securities; and certify that, in our opinion, the above balance sheet is properly drawn up so as to exhibit a true and correct view of the state of affairs of the Association as at 28th February, 1954 according to the best of our information and the explanations given to us and as shown by the books of the Association.

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

Johannesburg,
2nd April, 1954.

ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTHERN AFRICA

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 28th FEBRUARY, 1954.

1953					1953					
£ 8	Audit Fees			8 8 0	£1,018	Subscriptions			£1,061 11 0
11	Bank Charges			9 18 7	59	Interest on Fixed Deposits			95 18 7
224	Convention Expenses			151 2 3	2	Donation			—
2	Insurance			2 9 0		B.E.A. Journal:			
7	Depreciation			6 7 9		Subscriptions received	1 16 0		
17	Printing and Stationery			23 5 7	—	Less: Cost	1 11 6		4 6
24	Postages and Telegrams			23 16 1					
48	Rent			48 0 0		Proceedings:			
90	Secretarial Expenses			117 6 9		Advertising — Net	560 11 6		
487	Secretary's Salary			535 8 11		Sales	169 10 0		
15	Telephone			13 3 6			730 1 6		
67	Executive Committee Expenses			—	—	Less: Cost of Printing	598 17 10		131 3 8
23	Subscriptions			15 0 0					
107	Loss on Proceedings			—	51	Excess of Expenditure over Income transferred to Accumulated Funds			—
—	Excess of Income over Expenditure transferred to accumulated funds			334 11 4					
£1,130				£1,288 17 9	£1,130				£1,288 17 9

(*Sgd.*) SAVORY & CO.

Incorporated Accountants.
Auditors.

Mr. J. C. FRASER (Johannesburg): I would like to take this opportunity to pay tribute to the Secretary and Treasurer for his valuable services rendered.

PRESIDENT: Are there any comments on the report? No comments were offered and the report was unanimously adopted.

ADJOURN FOR TEA

PRESIDENT: I am now going to deliver my Presidential Address, and shall therefore, ask Mr. Hugo the Vice-President to take the chair.

Mr. D. J. HUGO (Pretoria): Gentlemen, I have great pleasure in calling upon Mr. Muller to deliver his Presidential Address.

Mnr. G. J. MULLER (Bloemfontein): Mnr. die Voorsitter, U Edele die Administrateur, Mnr. die Burgemeester, Dames en Here: Eerdat ek in Engels voortgaan, wil ek net in belang van ons Afrikaanse afgevaardigdes 'n kort opsomming in Afrikaans lewer. In my voorsittersrede het ek veral probeer om klem te lê op twee sake. Eerstens het omstandighede heelwat verander wat die plek van elektrisiteit in die samelewing betref, en is 'n herwaardering van die posisie van die Elektrisiteitsonderneming onder munisipale bedrywighede nie onvanpas nie. In die tweede plek lê ek klem op die belangrikheid van personeel in suksesvolle voortsetting van die onderneming, en die noodsaaklikheid om dieselfde aandag aan personeel — as aan tegniese beplanning te wy.

THE PLACE OF THE ELECTRICITY UNDERTAKING IN MUNICIPAL AFFAIRS

PRESIDENTIAL ADDRESS

By G. J. Muller, Bloemfontein

Mr. Chairman, Ladies and Gentlemen: Municipal activities, and in the same measure municipal conferences, have greatly multiplied in the course of time until a stage has now been reached where municipalities in general feel that a brake should be applied. How and where this should be done is however, a difficult matter for a council to decide.

No councillor can be expected to have an intimate knowledge of all the activities and problems of each individual municipal department, his functions as a councillor not being of an executive nature. And yet he must sift the wheat from the chaff and hold the balance between the various sections of the municipal machine.

It has therefore occurred to me that a good purpose might be served by attempting to place the Electricity Undertaking as a municipal enterprise in more clear perspective, without drawing odius comparisons.

The original main functions of a municipality were to provide a water supply for the inhabitants, build and maintain streets, provide sanitary and cleansing services and generally to uphold the dignity of the Town by providing appropriate public buildings and parks, all costs being covered by municipal rates.

The rise of the social state has however, also left its stamp on municipal government, and today the local authority is saddled with a multitude of services and duties which a century ago were either not thought of or they were the responsibility of the state or the individual: among these latter services are the trading undertakings, which render services that cannot equitably be covered by the rates, and have in fact in some instances become instruments for boosting the income from rates.

This is the case with the Municipal Electricity Undertaking. Considered a necessary sideline, which could be quite a useful sourse of revenue, it has usually been grouped with some other activity such as transport or water supply to find sufficient work for one committee. If the electricity supply had remained little more than "the lights" there would be much justification for such a procedure, as the activities of the Department would have remained on a relatively small scale and the subject matter of reports not of much interest to the average councillor.

Technical progress has, however, changed this picture entirely. The use of electric energy to replace human effort and other forms of energy has pervaded the industrial, commercial, medical and domestic activities of towns and cities to

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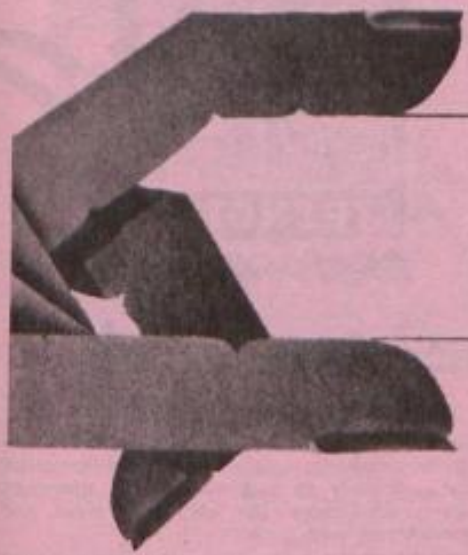

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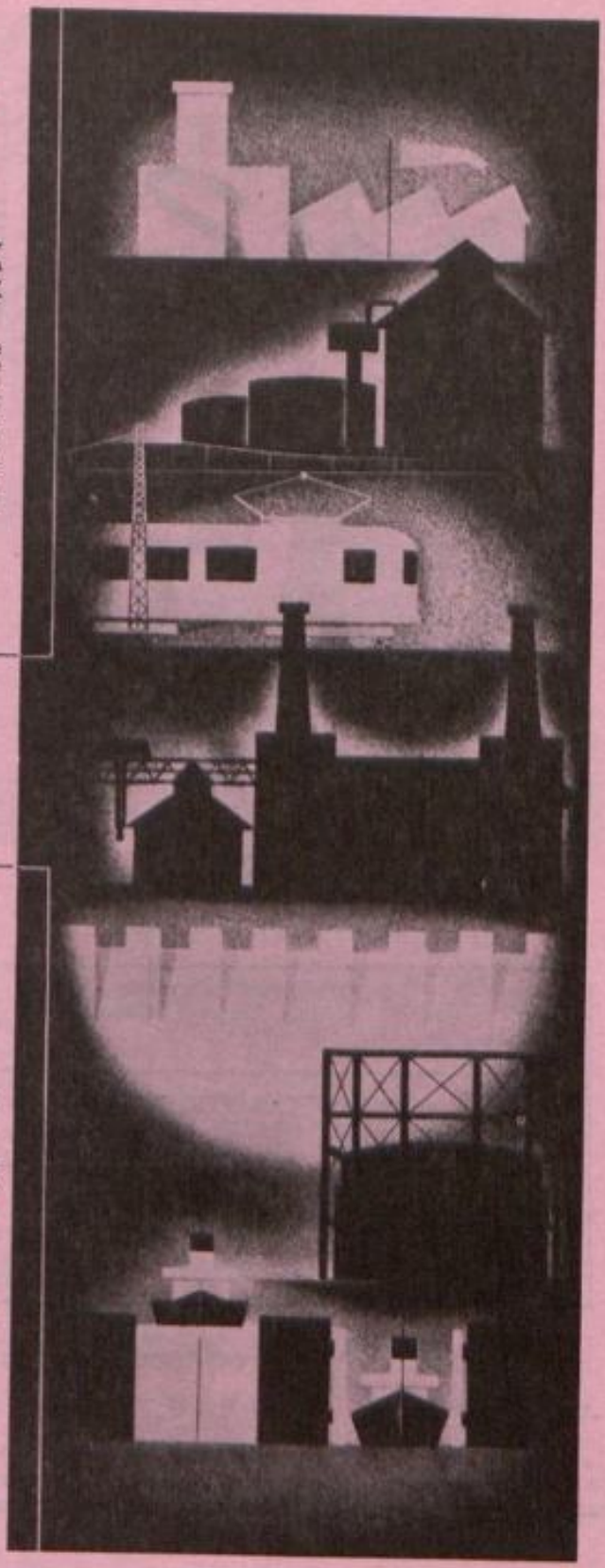

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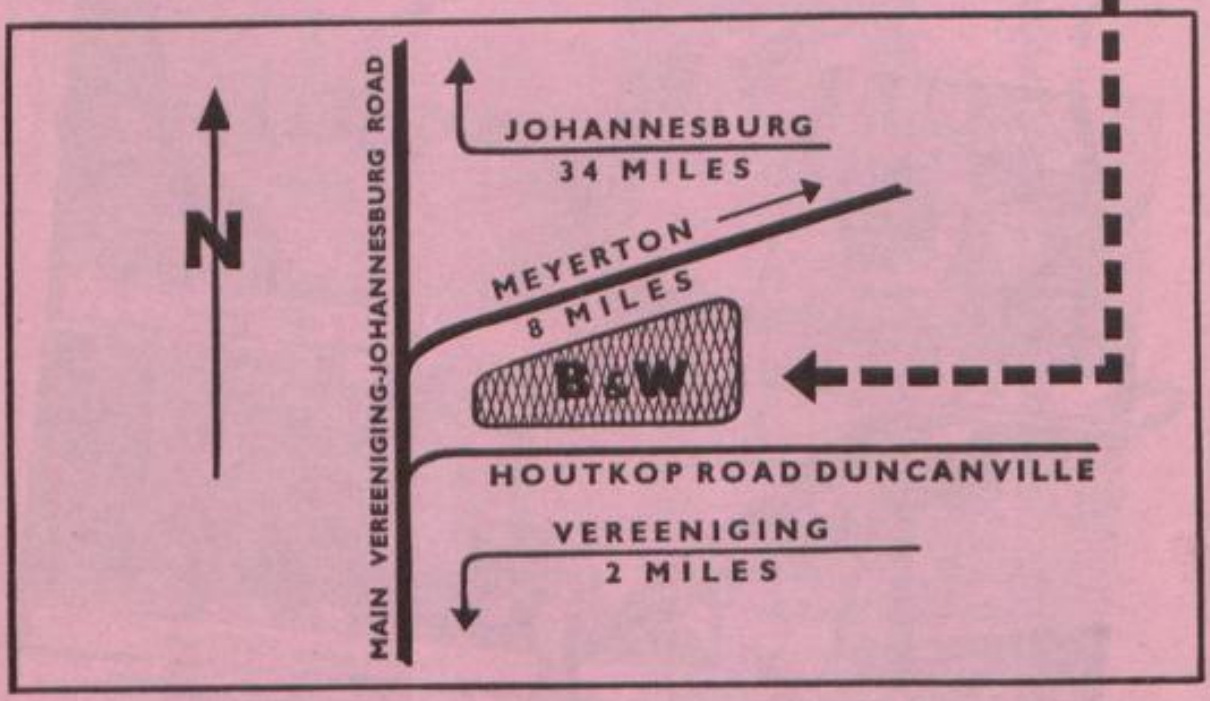

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such an extent, that its loss would practically bring normal life in a city to a standstill. It has in fact become the lifeblood of the city not only because it has become the power responsible for the normal functioning of our homes, factories, business houses and hospitals, but it is more often than not essential for that vital service — water supply. No town can hope to progress without adequate water and electric power supplies, and where these essentials have been duly cared for, the other things which spell prog ress seem to follow.

Where electricity has become a *sine qua non* of town and city life it has unavoidably been followed by the demand for a higher standard of service than would have been considered satisfactory some twenty five years ago, and the energy used per consumer has increased by leaps and bounds. These in turn have had two important effects namely greatly increased capital costs and a higher standard of skill required on the part of responsible personnel, the cost factor being further accentuated to a disproportionate degree by post war price increases. Considering the municipal electricity undertaking as a trading or industrial concern it is in most cases, from the point of view of invested capital by far the largest single undertaking in the town, particularly where both generation and distribution are undertaken.

The combined generating capacity of member municipal undertakings may not appear very impressive in comparison with that of the E.S.C. as the number of large towns or cities is limited, and the great majority of municipal undertakings comprise small stations of not more than a few hundred Kilo Watts Capacity. The total of over 741,000 kW according to the 1951/52 municipal year book would, if the capital cost were taken at £80 per kW, represent an investment of over £59,000,000 in municipal generating plant only. It is perhaps, a little silly but nevertheless interesting to contemplate that the electric power involved could lift a boat like the *Capetown Castle* from sea level to the top of Mount Everest in well under an hour, while the capital would be sufficient to finance twenty economic housing schemes of about a thousand houses each.

This is by no means the full extent of municipal electricity undertakings. For each municipal Power Station there must be a distribution system to make the generated power available to all consumers at voltages most suitable for the circumstances. In addition to these generating undertakings there are a large number of undertakings who prefer to pass on the responsibility for generation and purchase power in bulk for distribution in their area. Bearing in mind the high capital cost of generating plant, staff difficulties and the lower generating cost of large undertakings, it is not surprising that there has been a strong tendency in this direction as evidenced by about 786,000kVA of installed transformer capacity in bulk supply undertakings. This would probably not account for a summed demand of more than 400,000 kW, but even this is by comparison an impressive figure.

The development of electrcity undertakings has not lost in momentum since the year referred to, and more millions have since been invested in further extensions, but sufficient has no doubt been said to make it clear that this item of muncipal enterprise is literally and figuratively a "power in the land".

An industry with invested capital of the order referred to, is without doubt important, but not necessarily essential for human progress and happiness. I would therefore like to dwell briefly on the question whether these heavy commitments for the development of electricity undertakings are justified and in the best interests of the public.

I am not at all sure that electric power with all it has made possible, has been an unmixed blessing. Happiness is not due to what we have, but what we are content with, and when we reflect on what people were satisfied with fifty years ago, and what they now demand as a minimum for a civilised existence, we wonder.

Such philosophic reflections do not, however, get us any further on the road to happiness. We are children of our day and cannot go back. Having created wants and cultivated habits of life, our generation will never be content again without these. Electricity has so per-

meated our modern existence, and its absence would create so much hardship that the man in the street has settled the question of essentiality by demanding electricity supply when, where and as much as he wants. The question before councillors today is therefore not whether they should supply electricity, but how much they should supply, and I am very sure that a Council would be more easily forgiven by the public for overdoing an extension than for not making adequate provision for any likely demand.

If we now concede that electricity supply is an indispensable service, we may be permitted to ask if sufficient thought is being given to preserve this service for the benefit of the public.

To provide the most modern equipment of ample capacity for generation and distribution is not sufficient. Such plant would serve no purpose if it were not satisfactorily operated and adequately maintained. This requires maintaining the necessary complement of skilled staff with all necessary material and equipment at their disposal for the efficient performance of their various duties.

The more expensive and involved the plant becomes the more necessary it is not only to see that sufficient staff is always available but also to maintain the necessary degree of skill for every post.

Under present conditions it is much easier to lose a good man than to find a satisfactory replacement. This is probably true of all spheres of employment, but I think I can say without fear of contradiction that really satisfactory power station staff, engineers, operating men and artisans top the list in this respect.

This position will no doubt improve by training and immigration, but no material improvement is noticeable so far and meanwhile the undertaking must provide service.

Most of us are uncomfortably aware of this position and some of us may think that they would cure their troubles easily enough if they were allowed a more free hand with salaries. I do not say that a reassessment of the market value of labour is not necessary, but indiscriminate bidding for labour only starts a snowball and places councils with such a variety of employees, in a very difficult position.

On the other hand, in their efforts to be scrupulously fair to all their employees, Councils sometimes lost sight of essentials. To arrive at these essentials, let us apply the old method of proof by *reductio ad absurdum*, or "going to extremes". In dire circumstances such as an air raid or an earth quake, no one would be concerned about any of the Councils activities except fire, water, sewerage and electricity services, and if the latter disappeared the first three would soon follow suit.

I submit therefore that every Council should consider it a basic duty to maintain these to the best of its ability. Having provided the capital for necessary extensions, it must determine scales of wages which will enable it to draw sufficient, adequately skilled men into the service and also every avenue should be explored to consolidate the position by improving the knowledge and skill of the men in its service.

Pay alone does not however keep men. Discontented men are always on the lookout for other employment and good men do not take long to find it. The happy employee on the other hand spends his time more pleasantly than by scanning the vacancy columns in the press.

Chronic grousers there will always be, but the average man is not too hard to please. Working conditions should be as congenial as circumstances permit, and a team spirit is most desirable, but more than anything else overworking men through insufficient staff, and poor or too expensive housing should be avoided. Men start their day at home, and if they can start feeling fit and in a happy frame of mind, the probability that they will turn out good work has been greatly enhanced.

If I have wandered from power stations to staff, I can assure you that I have done so deliberately. During twenty four years in the municipal service, I have had this basic fact brought home to me that the staff of the undertaking is really its most valuable asset, for no matter how excellent or valuable the plant may be, it will perform no better than the staff will permit it to.

If we agree that no town with any pretension of progressiveness can exist, let alone prosper without electricity, we will plan our schemes boldly, but in doing so let us see the undertaking as a whole, working, concern comprising two elements, the one human, the other machinery, both equally important and dependant on each other. Our planning for the human element should therefore be as careful as for the machinery element, no money being wasted on overdoing anything, nor the undertaking jeopardised by misguided saving on essentials.

Mr. HUGO (Pretoria): I will now ask Mr. J. C. Downey of Springs to propose the vote of thanks.

Mr. J. C. DOWNEY (Springs): Mr. Chairman, Mr. President, Gentlemen: I am indeed grateful for the opportunity given to me in thanking Mr. Muller, our President, for his address. This is the third time in 30 years that the Convention has elected an engineer member as President for the second time.

Mr. Muller served on the A.M.E.U. Advisory Committee convened by Mr. Rodwell during the war years. He was then Electrical Engineer at Krugersdorp and later he was appointed City Electrical Engineer of Bloemfontein. In 1946 Mr. Muller was elected President of this organization. He has always maintained a keen interest in the affairs of the Association. We have today had the opportunity of listening to his most interesting and constructive presidential address. The facts he has brought before us must be most interesting and valuable to our Engineer and Councillor Members.

Your address, Sir, I am sure will be most helpful in the planning for the future of their undertakings, and I have, therefore, great pleasure in proposing a hearty vote of thanks to our President for his excellent address.

Mr. HUGO (Pretoria): I will now call upon Councillor Acton of Pretoria, to second the vote of thanks.

Councillor C. E. ACTON (Pretoria): Mr. Chairman, Mr. President, Gentlemen: I am indeed happy for the opportunity of seconding the vote of thanks to our President for his very interesting address. I need say little in support of what the proposer said because the President's remarks readily commend themselves.

He has given us much food for thought — we are all aware of the pertinence of the points he made, and which must leave us in a reflective mood.

It gives me great pleasure to second the vote of thanks.

Mr. D. J. HUGO (Pretoria): I now ask the President to take charge of the meeting again.

PRESIDENT: Thank you Mr. Hugo for taking over the duties so ably.

Before we adjourn, I omitted to mention that the Executive consists of, the President, Vice-President, 2 Immediate Past Presidents, 6 Elected Engineer Members and the Towns associated. The Towns on the Executive are:—

Cape Town,
Springs,
Port Elizabeth,
Salisbury,
Krugersdorp,
Pietermaritzburg,

and of course also: Bloemfontein and Pretoria. The Executive will meet to-morrow morning at 8.30 in the Committee Room. We shall now adjourn until to-morrow morning at 9.30.

SECOND DAY

WEDNESDAY — 12th MAY, 1954

PRESIDENT: Good morning, Gentlemen: Goeie môre Here — dit is die tweede dag van ons Konvensie — it is the second day of our Convention. I have a few announcements to make before I carry on with business.

Transport arrangements for this afternoon, are as follows:- Members who have their own transport must leave from the Northern Side of the Hall for Mazelspoort. Members who have asked for transport must also meet there, and we will fit them in. We will leave under the guidance of one of our traffic inspectors. It is expected that the return journey from Mazelspoort will start at

about 7 o'clock or it may even be a little later.

The photograph will be taken on the Northern side of the Hall, just before the tea break.

Reverting to our programme, we have decided that it would not be desirable to upset our programme to fit in the items left over yesterday. These will be fitted in wherever possible, in the meantime we will carry on according to the agenda.

The first item to be dealt with is the appointment of Auditors. Have we any proposals in that connection?

Mr. J. C. FRASER (Johannesburg): I have much pleasure in proposing that the Auditors who have audited our Books for the last six years be re-appointed, they are Messrs. Savory & Co.

PRESIDENT: Mr. Fraser has proposed last year's auditors to be re-appointed, namely Messrs. Savory & Company, are there any other proposals? Everybody satisfied? Agreed.

The next item on our programme is Mr. Wrigley's paper, and I have much pleasure in calling on him to read it.

GENERAL DISTRIBUTION PROBLEMS

by

P. WRIGLEY, M.A. (Cantab.), A.M.I.E.E., Salisbury.

(1) Introduction

1.1 With the progress of the supply industry in Southern Africa, there has arisen the necessity for control and vision in respect of the future planning of supply networks. This was never more true than in the sphere of low voltage systems.

In 1920, during a discussion on a paper about distribution networks, the following statement was made :—

> "Elaborate calculations are quite out of place in connection with distribution networks because the load is constantly growing and engineers would get to know, by looking at the street, the sort of mains they ought to put into it, and I do not believe that anything would ever take the place of intuition in that respect."

That remark was made 34 years ago, but it is only comparatively recently that moves have been made to get away from the rule of thumb or intuition and to try, instead, to do a little research into the future needs of the consumer and the economic ramifications of network design.

1.2 Last year I was fortunate enough to be able to spend a few weeks at the headquarters of the North Western Electricity Board in England, and see for myself what steps, if any, had been taken to unify the widely differing policies and ideas that were held by the various undertakings prior to nationalisation of the supply industry in April, 1948. What I saw during that short visit has assured me that in so far as the headquarters organisation is concerned, the problems of planning and co-ordination of the various districts under the Board are being tackled realistically, and that much benefit, economically and technically, will result from their work.

1.3 The remarks that I have to make to-day are based on one or two ideas that were given to me on that visit, as I consider that they may be of use when considering distribution planning in any areas.

(2) L.V. Networks

(2.1) Statistics.

Before tackling a problem, there is always the need for accurate information in respect of factors affecting the problem directly and indirectly. With L.V. networks one must be able to compile statistics of diversity factors applicable, maximum demands and phase unbalance. The two former factors can be fairly accurately ascertained for the present time by means of phase ammeter readings over sections of the area, but the network is being planned for forty years ahead if we take that period as being the life of any cable associated with the network.

The future estimation is made very much easier in areas where there is no alternative to electricity, for there is little reason to think that an all-electric house will be very different in forty years time

to what it is to-day. Figures taken on a Salisbury housing scheme during the winter of 1953 gave an A.D.M.D. of 3.03 kW per consumer, and on this reading it is logical to take 4 kW per house or large flat as a firm figure on which to base future calculations.

(2.2) Town planning

With regard to rate of growth and the type of load that can be expected in an area, the local Town Planning authority can be of immense help, for from the size of stands and space factors applicable, the maximum load possible in any area can be deduced, and network design can be put in hand with a firm knowledge that the ultimate requirements of the area will be met, and no provision for extension need be made. This information is also of help in the siting of substations which, in areas where growth is gradual, is believed to be a very haphazard process with day-to-day requirements overriding those of the ultimate picture.

(2.3) Network design

With all the facts and figures to hand, the range of network designs is large, and the problem of finding a design which offers the maximum economy can be laborious. The costs of substations and H.V. cable runs in any given undertaking can be more or less regarded as standard items, but L.T. reticulations can be carried out in so many different ways and with so many varying cable sizes that to compare costs is a very tedious business.

(2.4) Hypothetical network

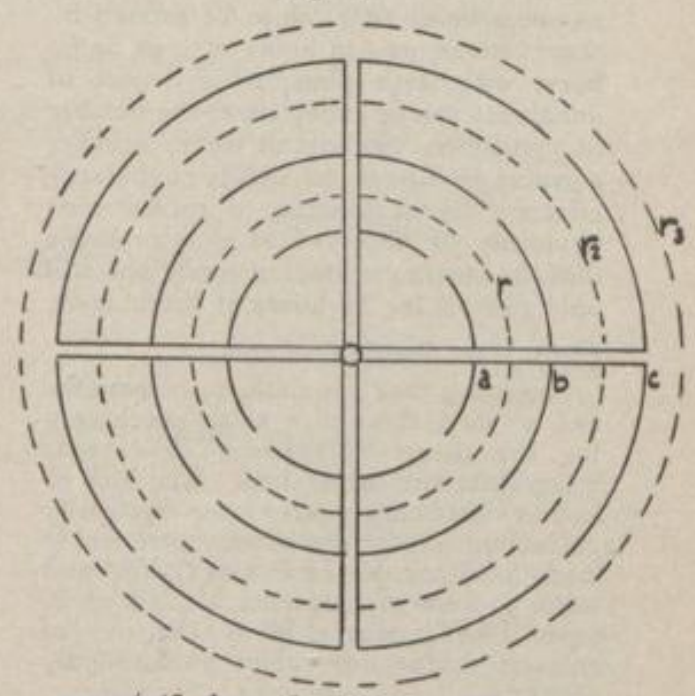
Consequently I was struck by the method developed by F. G. Copland of the North West Board, using a hypothetical network. This hypothetical network is by no means just a geometrical figure taken for the convenience of the engineer. It is definitely an attempt to simulate housing scheme layouts as a symmetrical figure, and has been arrived at by taking the layouts and obtaining a geometrical design that approximates to practical conditions. Obviously such a design is a useful tool for the comparison of costs of cable sizes that might be used.

The type of network is as shown in Fig. 1. It consists of radial arms, the load on which at any point is proportional to the square of the distance from the supply source. Loads away from the radial are fed by branch feeders. At times of maximum uniform loading, the network may be regarded as equal segments of a circle in which the electrical conditions are similar.

(2.5) Network comparisons

Numerous networks were plotted on actual estates to substantiate this hypothetical network, and it was found that six or eight radial feeders were most satisfactory. This, of course, is all right in so far as the coverage of the area is adequate, but how did the theoretical lengths of L.V. cables compare with the practical cable routes ? To ascertain this, fifteen eight radial networks were taken, and the practical routes were compared for length with the theoretical ones. The mean site length of radial and outer was

Fig. 1.



$ra = r/\sqrt{2}$ $rb = \sqrt{3}\, r/\sqrt{2}$ $rc = \sqrt{5}\, r/\sqrt{2}$

$\pi r^2 = 1/2\pi r_2^2 = 1/3\pi r_3^2$

found to be about 96% of the theoretical value. The overall inner branch length was not so accurate, but by taking an analysis of differing unit area routes, a correction factor was deduced for practical to theoretical values.

Consequently the theoretical network length for an eight radial network becomes $8(2.82r + 1.53r\ K)$ where K is the correction factor already referred to. Now that the geometrical network, which is a due approximation to site averages, has been arrived at, it is easy to evaluate formulae for maximum voltage drop and losses. Here the question of phase unbalance appears, for it is obviously the heating of the most heavily loaded cable phase that will determine the maximum possible cable loading. The question of phase unbalance is very important in network design, and I submit that the only way of obtaining true information on this subject is to take voltage readings on circuits with varying numbers of consumers, and to correlate the results obtained in graph form. It would appear logical to assume that the balance with a larger number of consumers will be better than with a smaller number, but the actual numbers involved have to be proved by observations, and in areas such as Salisbury, with large plots, some degree of unbalance can be expected, as the number of consumers per circuit never reaches a value sufficient to nullify unbalance effects. Cyclic loading of cables must obviously be observed as it is probable that the maximum loading conditions will only prevail for 1½ hours at the outside.

(2:6) Unit distribution area

Assuming that this method of treatment can be used, there now exists machinery for the direct comparison of layouts using different cable sizes. The size of a unit distribution area can be easily calculated if the maximum permissible loading of a cable is P max k.W., and each consumer represents a load of X times PkW., where X is the out of balance factor, n cables will supply $\frac{nPmax}{XP}$ consumers, and with a building density of d consumers per acre this represents an area of $\frac{nPmax}{XPd}$ acre. From this expression the radius of unit distribution area

$$r_s = \sqrt{\frac{4840\ nPmax}{XPd\ \pi}}$$

the radius of unit distribution area

As the cost per foot of cable or overhead line can be estimated, this cost, when inserted in the expression for network length gives the overall cost of L.V. distribution. The cost of L.V. network losses can also be arrived at from the maximum loss, again calculated from the hypothetical diagram, multiplied by the load factor of the losses.

The L.V. network costs arrived at on this basis assume a standard L.V. cable size on both radial and transverse branch feeds, with this design, losses occurring on the branch feeders are less than 10% of the total network losses. If smaller section branch feeders are taken, network costs will be reduced and losses increased, which is a step nearer to the unattainable economic optimum.

(2.7) Overall network costs

When considering the cost of a network price per consumer, it is necessary to include the H.V. cable and substation cost in the analysis. No convenient method of assessment is available, and each scheme must be assessed individually. The number of substations required obviously varies inversely with the size of L.V. cables, and the effect they have on the gross cost per consumer is decided by the simplicity of design.

Personally I consider that a steel kiosk design of substation to take up to a 750 kVA transformer is a robust and cheap way out of the matter. It will cope with the requirements of a unit distribution area of reasonable size, and at the same time it can be arranged so as not to be offensive to the eye. In certain areas of aesthetic importance, a building can be provided that is in effect part of the general arrangement, but the number of

times when this is necessary are few and far between.

As regards H.V. cable, a system involving a ring main principle linking all unit area substations to a control station is much to be preferred to any type of transformer feeder arrangement utilising H.V. isolating switches. On such a ring it would be possible to allow up to eight 500 kVA or thirteen 300 kVA substations on a .1 sq. in. 11 kV cable and the reliability of supply is considerably increased.

(2.8) Voltage regulation

The present considerations have not included any reference to voltage regulation, and this is a question which must be related to the statutory regulations applicable to a particular undertaking.

It may be that when values are substituted in the expression for maximum voltage drop on the hypothetical network, the allowable percentage voltage drop will be exceeded. If this is so, either some means of improving the regulation must be provided, or the network design must be modified, with the limiting factor being maximum voltage drop allowable and not cable rating.

A useful method of recording the maximum voltage drop of a unit distribution area using a 1 : 2,500 scale plan comes to mind. Assuming a PkW balance load per consumer uniformly distributed throughout the area, then % V.D. on a cable

$$= \frac{\text{Resistance of cable} \times \text{I phase consumer} \times 100}{\text{phase voltage}}$$

$$= \frac{100\ R_c I}{220}$$

for .06 sq. in. cable $R_c = .4164 \times 10^{-3}\Omega$ per yard.

$$= .4164 \times \frac{2500 \times 10^{-3}\Omega}{2.54 \times 36} \text{ per 2500 cms.}$$

$$= .4164 \times 27.3 \times 10^{-3}\Omega \text{ per 2500 cms.}$$

or $.4164 \times 27.3 \times 10^{-3}\Omega$/cm on 1 : 2500 scale plan

$$I = \frac{kW \times 1000}{volts} = P \times \frac{1000}{220} \text{ amps per consumer}$$

$$= \frac{P \times 1000}{3 \times 220} \text{ mp per phase per consumer}$$

$$\% \text{ voltage drop per house centimetre} = \frac{.4164 \times 27.3 \times 10^{-3}\Omega \times 1000 \times P \times 100}{3 \times 220 \times 220}$$

$$= \frac{.4164 \times 27.3P}{3 \times 22^2}$$

If different cable sizes are used a multiplier is introduced which is inversely proportional to the cable size. By counting the number of consumers on a proposed cable route, and measuring the route length in centimeters, percentage drops are easily calculated, and if compiled in graphical form, a complete volt drop picture of the unit distribution area can be easily obtained. To take account of phase unbalance the percentage volt drop at any point should be multiplied by the unbalance factor applicable to the number of consumers under consideration.

(2.9) Standby capacity

So from the expressions deduced, a network can be designed that will keep costs to rock bottom, but it will be a network engineered to the finest limits. I would not be too happy with such a state of affairs for I contend that a supply undertaking has a duty to fulfil to its consumers. Consequently I feel that a little extra money spent to this end is

quite justifiable. Perhaps one way where this is possible without basically altering the network design is by improving the continuity of supply. In these days this question should not be lightly dismissed. Load shedding has been all too frequent, and consumers are loath to be without supply for either fault or maintenance purposes. L.V. fault rates are not very high, and I have already advocated a ring main H.V. system which is considerably more fault free than single line spurs. Consequently I do not feel that anything like 100% standby capacity should be provided anywhere except where it is absolutely essential.

(2.10) Interconnection

For maintenance purposes I advocate the interconnection of unit distribution areas on the L.V. side and in important areas such as city centres that the capacity of these maintenance interconnections should be increased so that in the event of a fault, important consumers can still be back-fed. This is possible at not too great a cost by the use of pillar boxes and underground link boxes.

(3) Transformer loading

(3.1) Introduction

L.V. networks are not, however, the only sphere where the economist is in his element, and I propose to examine another report of the North West Electricity Board in respect of transformers that I think is worthy of a few minutes' study.

The present restrictions on capital expenditure have brought about the practice of loading a transfomer to the maximum permissible before changing to one of a higher capacity. Indeed, many papers have been written and views expressed about the amount of overload to which a transformer can be subjected without serious deterioration. The purpose of the report is to show that economically such practice is unsound.

(3.2) Method of approach

In these days, the practice of reducing power station voltage as a means of reducing system load prior to actual shedding is well known. This idea reversed will mean, of course, a boosted voltage with a consequent increase in load on a network with the same external circuit resistance.

(3.3) Losses

Considering a distribution transformer, the annual costs which an undertaking is called upon to meet are :

(a) iron loss
(b) copper loss
(c) capital charges

By increasing the size of this transformer the voltage conditions improve, with a consequent increase in revenue. It is realised that not all appliances will give this increase. The quantity of electricity used by such apparatus as kettles, water geysers, boiling plates, etc., will not be increased by any large amount since such apparatus will be switched off either thermostatically or as soon as boiling is observed regardless of the time taken to fulfil its function.

(3.4) Transformer change point

Taking these factors into consideration, it seems logical that at the transformer change point the increase in revenue, plus the decrease in copper loss cost should balance the increase in iron loss cost plus capital charges. The cost of changing a transformer does not figure in the calculations. In an area accepting the proposed methods of transformer loading, larger transformers would be installed compared with present practice, but the number of subsequent changes to meet load growth would not be greater than at present. If a gradual change to recommended loading is made when the individual transformers become overloaded, the same applies.

To justify the claims of this treatment, figures applicable to the Salisbury Municipal Undertaking are used, and these figures, together with symbols used in the analysis, are given in Fig. 2.

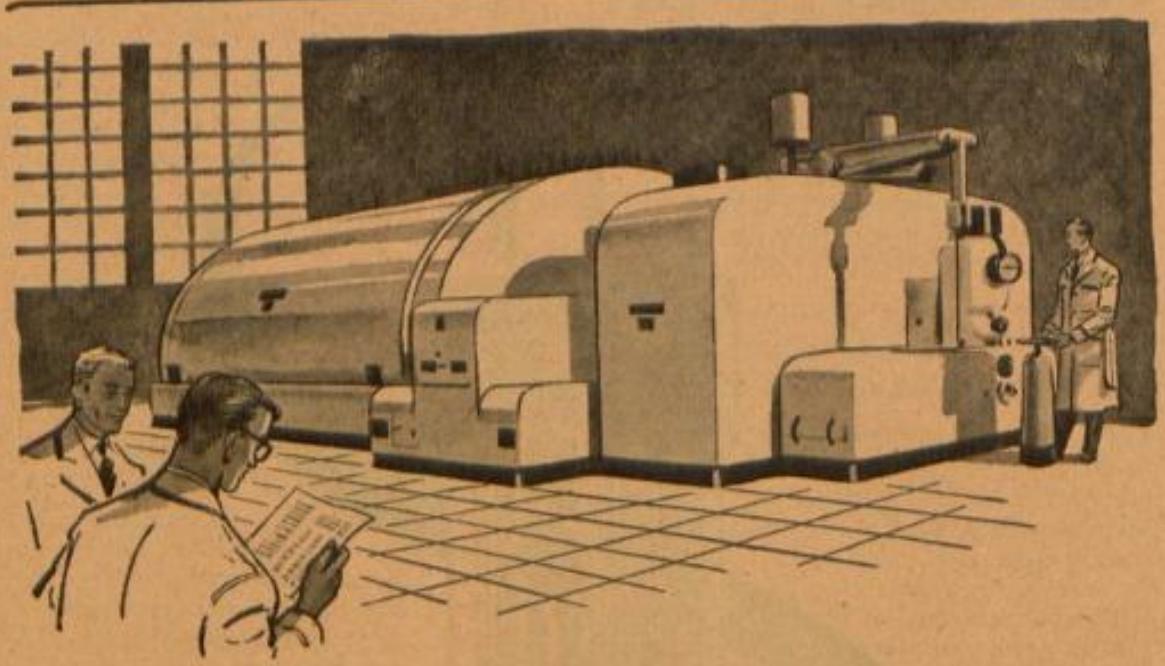


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Fig. 2.

P=Transformer maximum demand
U=Transformer utilisation factor defined as $\frac{\text{Peak load}}{\text{Transformer nameplate rating}}$
W=Transformer full load rating
Cu=Full load copper loss in kW.
Fe=Iron loss in kW.
F=Transformer load factor
Z=Load factor of the losses from $Z = .3F + .7F^2$
C=Salisbury maximum demand charge £5.2 per kW.
c=Salisbury unit charge £.0015 per kWh
p=Price per unit to consumer (domestic average 1.066d. per kWh)
C_t=Transformer capital cost

(3.5) Expressions for losses.

The annual costs of transformer losses plus depreciation are made up in the following way :—

Annual copper loss

$$= \text{maximum demand} + \text{unit charge}$$
$$= £Cu\left[\frac{UW}{W}\right]^2 C + Cu\left[\frac{UW}{W}\right]^2 8760ZC$$
$$= £CuU^2 (8760ZC + C)$$

Annual iron loss
$= £FeC + Fe\ 8760c$
$= £Fe\ (8760c + C)$

Annual depreciation and interest
$= £C_T\ .075$

Total annual costs
$= £C_u U^2(8760+C) + Fe(8760c+C) + C_T.075$

If we solve the equation, a table of annual costs is arrived at, and this is tabulated in Fig. 3.

Fig. 3

Size of transformer	Iron loss	Full load copper loss	Cost of transformer	Depreciation 7½% capital	.3 load factor Z/F = .51	.35 load factor Z/F = .55
50 kva	.449 kw	1.056 kw	£306	22.95	$7.6U^2 + 31.2$	$8.17U^2 + 31.2$
100 kva	.53 kw	2.081 kw	404	30.3	$15.1U^2 + 40.1$	$16.1U^2 + 40.1$
200 kva	.928 kw	3.13 kw	612	45.97	$22.7U^2 + 63$	$24.3U^2 + 63$
300 kva	1.37 kw	4.591 kw	727	54.52	$33.2U^2 + 80$	$35.5U^2 + 79.9$
500 kva	1.8 kw	6.724 kw	1050	78.75	$48.6U^2 + 111.7$	$52.1U^2 + 111.7$
750 kva	2.646 kw	8.855 kw	1442	108.15	$64U^2 + 156.7$	$68.6U^2 + 156.7$
1000 kva	3.243 kw	10.615 kw	1792	134.4	$77U^2 + 193.9$	$82.5U^2 + 193.9$

The figures taken for copper and iron loss are from the test sheets of transformers in commission on the Salisbury network.

The increase in revenue per annum can be obtained from $\frac{£8760}{240} P \left\{ F_2P_2 - F_1P_1 \right\}$

From standard regulation curves, the ratio $\frac{P_2}{P_1}$ may be obtained in the following way. If Rc is the resistance of the external circuit and remains constant, then

$$P_1 = \frac{3(V_1)^2}{Rc} \text{ and } P_2 = \frac{3(V_2)^2}{Rc}$$

where V_1 and V_2 are the terminal volts of the smaller and larger transformer respectively

$$\therefore \frac{P_2}{P_1} = \left[\frac{V_2}{V_1}\right]^2$$

It can be proved by calculation that $\frac{P_2}{P_1}$ is a factor of U_1 for two given transformers such that $\frac{P_2}{P_1} = K^{U_1}$

Values of K for any two transformers can therefore be determined from the regulation curves.

(3.6) Increase in revenue

If the ordinates of any curves are multiplied by a constant, the load factors

of the curve are equal. Since $\frac{P_2}{P_1}$ is not a constant but a function of U_1, the load factor of the larger transformer F_2, cannot equal the load factor of the smaller transformer F_1 for the same conditions of the load circuit. An average value for F_2/F_1 is about .997. Since this is so close to one, it can be assumed to be equal to one, thus biasing the calculations in favour of the larger transformer.

Losses on the L.V. network will obviously increase due to the increased loading conditions, but the increase is so small compared with the increased load that it can be neglected.

The complete expression for increase in revenue is therefore

$$£\frac{8760}{240}\,p\,F_1P_1\,(K^{U_1}-1)$$

but $P_1 = U_1W_1$ and $K^{U_1} - 1 = (K-1)\,U_1$ with negligible error so that the expression becomes

$$£\frac{8760}{240}\,p\,F_1W_1\,(K-1)U_1^2$$

(3.7) Overall loss expressions

The losses for the smaller transformer take the form $£aU_1^2 + b$, where a and b are constant, and the losses for the larger transformer take the form $£xU_2^2 + y$, where x and y are constants.

In order that these two equations may be equated, U_2^2 must be converted to U_1^2

$$U_2^2 \Omega \frac{W_1}{W_2}{}^2U_1^2$$

so that the expression for losses of the larger transformer becomes

$$\frac{xW_1^2U_1^2 + y}{W_2^2}$$

Taking the sum of the increase in revenue plus the decrease in copper loss cost, and equating it against the increase in iron loss cost plus interest and depreciation, an expression of the form

$$a_1U_1^2 + b - \left\{x\left[\frac{W_1U_1}{W_2}\right]^2 + y\right\} + \frac{8760}{240}\,p\,P_1W_1\,(K-1)\,U_1^2 = 0$$

is obtained.

(3.8) Values of economical change point

From this expression a table of values of economical change point for various load factors can be determined. Furthermore, if the transformer is operated over and above the utilisation factor at economical change point, the annual losses incurred can be estimated for varying values of U. Figures 4 and 5 give the values applicable to the Salisbury network.

Fig. 4

Transformer change		Load Factors					
from	to	.25	.3	.35	.4	.45	.5
50	100	.75	.69	.62	.61	.58	.55
100	200	.85	.79	.73	.73	.66	.62
200	300	.70	.64	.61	.57	.53	.52
300	500	.76	.70	.66	.62	.59	.56
500	750	.79	.74	.69	.65	.62	.59
750	1000	.69	.64	.59	.55	.53	.51

Fig. 5

Trans-former size	T_1 Annual losses B	T_2 Annual losses A	Income Rev. C	B+C-A U=.7	B+C-A .9	B+C-A 1	B+C-A 1.1	B+C-A 1.3
50	$7.6U^2 + 31.2$	$3.8U^2 + 40.1$	$14.6U^2$	£.1	£6	£9.5	£13.3	£22.2
100	$15.1U^2 + 40.1$	$5.7U^2 + 63$	$28.0U^2$	—	7.4	14.5	22.1	40.4
200	$22.7U^2 + 63$	$14.7U^2 + 80$	$32.7U^2$	3.1	18	23.7	32	51.9
300	$33.2U^2 + 80$	$17.6U^2 + 111.7$	$49.0U^2$	.2	20.8	32.9	46	77.9
500	$48.6U^2 + 111.7$	$28.4U^2 + 156.7$	$62.1U^2$	—	21.5	37.3	54	94.9
750	$64U^2 + 156.7$	$43.4U^2 + 193.9$	$70.0U^2$	6.8	35.9	53.4	72.2	115.6

Load Factor .3

This is the theoretical treatment, and several approximations have been made to arrive at the result. These approximations were all small, however, and do not materially affect the findings. This treatment was carried a stage further in the Manchester area when the law of the curve of load reduction, due to voltage reduction under load shedding conditions, was applied to the expression for increase in revenue. This gave a more practical result, and it tended to raise the economical change point about 5% above the value found by theoretical treatment.

(3.9) Conclusions

Under conditions of little or no capital restrictions, it would appear that a transformer should be changed for one a size larger when the load on it reaches about 75 to 80% of its rated value, with the obvious corollary that if this is the case, why have transformers so elaborately designed to withstand overloads that on economic grounds they should never be required to meet.

These ideas are but two methods of approach to problems that the distribution engineer is up against, but perhaps they show that a little time spent on prior investigation may justify a job on economic grounds as well as from an engineering point of view.

(4) Acknowledgments

4.1 The author wishes to express his thanks to the North Western Electricity Board of the British Electricity Authority for the information used from its technical reports, to colleagues of the Salisbury Undertaking for help in the preparation of the paper, to the City Electrical Engineer of the Salisbury Municipality for permission to use departmental information, and to the Association of Municipal Electricity Undertakings for the privilege of being able to attend the convention and present this paper.

PRESIDENT: I will now call upon Mr. C. G. Downie of Cape Town to propose the vote of thanks.

Mr. C. G. DOWNIE (Cape Town): Mr. President, Mr. Wrigley, it is my privilege on behalf of the members of our Association to thank Mr. Wrigley very much for the very interesting paper he has delivered to us today. He must have gone to a lot of trouble to prepare it. I know that Engineers in the Distribution Branch of the Electricity Department in Cape Town found Mr. Wrigley's paper very interesting and I have brought with me some notes as a contribution to the discussion which it will arouse. In the main these notes give some information about the Cape Town distribution system in respect of those aspects of the subject referred to by Mr. Wrigley in his paper.

The first half of Mr. Wrigley's paper deals with the design of low voltage cable networks. As Cape Town's low tension distribution system is an overhead one no parallel to the theoretical cable layouts referred to by Mr. Wrigley exists.

When a new area in an electricity supply system is developed, the electrical engineer can often obtain from the town planning authorities a good idea of the loading conditions to be catered for. In the case of purely residential areas with uniform plot sizes, figures for load density can be arrived at fairly accurately and can be put to good use in designing an efficient and economical network. In industrial and commercial areas, however, the load cannot be assessed accurately by the size of plots alone. As the heights of commercial buildings vary — e.g. such as those on the Cape Town foreshore are likely to, so will the load density of the plots on which the buildings are erected. Similarly, the loading of a factory area is difficult to determine beforehand. Wherever possible, it is the practice in Cape Town to call upon the larger industrial consumers to take a direct feed — either high tension or low tension — from the nearest substation.

In the case of older established areas where increasing loads are to be provided for, a big difficulty is the availability of additional substation sites. For example, in Sea Point, where numerous buildings

have been demolished to make way for large blocks of flats, the low tension distribution system has been modified as best possible by increasing transformer capacities in existing substations, doubling up feeder cables, increasing conductor sizes on the overhead low tension distribution network, etc.

In an endeavour to keep down the capital cost of a distribution scheme for one of our new townships a departure has been made from the usual practice of ring main fed substations with high and low tension switchgear and on load tap changing transformers. This township has been divided into five areas and from a 12 kV. switchboard in a centrally situated substation building, high tension feeders radiate to load centres of these areas. Each feeder terminates on a standard transformer (300kVA), the low tension side of which feeds the overhead network either directly or via a pillar box. To minimize voltage drops, the overhead network is arranged as far as possible for uniform radial distribution. In the event of a transformer breaking down, feeds to the area supplied by it can be obtained from neighbouring areas and by judicious design of circuits and fuse carrier points a good deal of flexibility of supply is thus made possible.

The cost of a scheme of this type represents a saving of about 40% below the cost of the conventional arrangement, the chief means of saving being the elimination of voltage regulators and the short lengths of low tension cable required. Absolute continuity of supply, of course, cannot be guaranteed, but as the breakdown of a transformer or high tension feeder would cause an interruption of supply for only a short period, the saving in capital cost makes this type of scheme attractive.

Apart from particular schemes, such as the above, however, it is doubtful whether the uncertainties of future load requirements make it advisable or possible to design low voltage networks for periods longer than, say 5 years.

Mr. Wrigley seems to have a preference for the steel kiosk type of substation of a capacity up to 750 kVA. It is the experience in Cape Town that township boards and municipalities do not take kindly to structures of this nature. For example, the Cape Town, Simonstown, Fish Hoek, Pinelands and other local authorities within the Cape Town area of supply require each substation building to blend in with the surrounding architecture. Though one might get away with a kiosk type of substation in an industrial or native area, this would not apply to a residential area.

In Section 3 of the paper, Mr. Wrigley deals with the economics of transformer loading. In evolving his equations, Mr. Wrigley gives the Salisbury figures for maximum demand charge and unit charge as being £5.2 per kW and £.0015 per kWh respectively. Presumably these figures refer to the high tension busbars from which the transformer is fed. Corresponding figures for the Cape Town Undertaking for 1952 were £5.7 per kW and £.00132 per kWh. The average price per unit sold to all consumers in 1953 was 1.11 pence, but this price produced a surplus of revenue over expenditure of approximately £400,000, all of which was taken for the relief of rates.

It is not this department's practice to overload its distribution transformers, the usual rule being that they are uprated when running at 80% to 100% of their full load capacity.

PRESIDENT: I would now call upon Mr. Fraser, to second the vote of thanks.

Mr. J. C. FRASER (Johannesburg): Mr. President, Gentlemen: I would like to take this opportunity of expressing my appreciation to Mr. Wrigley for his most interesting paper, which is a notable attempt to combine economy with good engineering design. The cost of low voltage networks and their losses are such large factors in present-day distribution costs that thorough consideration is necessary in planning a sound and economic layout and it is most appropriate that a paper of this type be presented to the Association.

I cannot agree with the author in the use of steel kiosks. These kiosks are unsightly and a storm of protests would soon be raised if they were used in the suburbs of Johannesburg — the few

existing on the network at present are being removed as soon as possible.

The author mentions statistics, this once again brings to mind the age old problem confronting Municipal Engineers — that of the man-power shortage. Until this problem is alleviated it is virtually impossible to have engineers engaged on extensive research and the compiling of the statistical data essential for network planning.

It is interesting to note that the after diversity maximum demand in Salisbury is 3.03 kW per consumer, the present figure in Johannesburg is 3.6 kW per consumer for all electric houses and with the rapid growth now being experienced in the use of electricity it is quite possible that a figure in excess of 4 kW per consumer may be reached within the life of the networks now being installed.

In the case of overhead low voltage networks such as are used in most South African towns and cities voltage regulation is the limiting factor in the loading and radius of distribution which may be allowed. Consequently, it would be necessary to use a formula for the radius of distribution in terms of the maximum permissible voltage drop and not cable rating.

I agree with the author on the question of standby capacity. Calculating to such fine limits may be inviting trouble where any unforeseen increase in loading occurs. Cables or conductors of sufficient size must be installed to facilitate interconnection between unit distribution areas in case of faults or for maintenance purposes, and it is here where a little intuition as mentioned by the author would prove most useful.

It was most interesting to hear that it is an economical proposition to change a transformer to one of a larger size after it has been loaded up to 80% of its rating, this is in contradiction to a very wide spread practice of loading transformers up to their maximum thermal limits. I can't help feeling that this would be a rather extravagent procedure in South Africa where transformers only attain maximum loading conditions for short periods for approximately three months a year.

I have very great pleasure in seconding the vote of thanks proposed by Mr. Downie and to congratulate the author in giving us this very stimulating address.

PRESIDENT: You have listened to Mr. Downie and Mr. Fraser. Have I your general acclamation to the vote? (*Applause*).

Before declaring the paper open for discussion, I must express my regret in the papers arriving rather late and members may not have had the time to study the paper. If members would like to put their views on paper, they would be very welcome to do so. The paper is now open for general discussion.

Gentlemen, we shall now adjourn for tea.

PRESIDENT: Will you gentlemen please take your seats, so that we can resume. Mr. Wrigley's paper is now open to general discussion.

Mr. C. R. HALLE (Pietermaritzburg): I would like to say I sincerely hope my City Council believe that I make all these elaborate calculations every time we change a Transformer. Other comments I would like to make on this paper are, first of all, Mr. Wrigley states that no change in domestic loading is expected for the next 40 years. That is stretching things a bit. In a hot town like Pietermaritzburg air conditioning and other such improvements will come into general use I hope and I think it is a bit far stretched to say little change will take place in the next 40 years.

Secondly, I note the preference for the steel kiosk, but no mention of out-door type substations. We are making more use of out-door transformers in the suburbs, camouflaging them with a pergola effect, cutting building costs.

I must congratulate Mr. Wrigley on his carefully prepared paper which is a serious attempt to provide an alternative to the old rule of thumb and intuition methods. After all if we continue to work by intuition perhaps our wives could do our jobs better than we can.

PRESIDENT: Any further discussion? After a good start like that, somebody might have the courage to say a few words.

Mr. V. E. O. BARRATT (Queenstown): I do not think that I have felt too pleased with this paper. It is most probably an excellent paper, but it upset me because it made me realize under what difficulties the many small Municipal Undertakings operate handicapped as they are by limited funds, and, for instance, how impossible it would be for a small Municipality to change a transformer when the optimum loading of 80% had been reached, and to instal a larger size. In fact, when the load has exceeded 80% to such an extent that the transformer is overheating badly, it would be cheaper to apply the suggestion previously made and instal a fan in the substation to cool the transformer.

This paper will help us tremendously for, though we may not in practice be able to apply the various formulas quoted, we will all have benefited both from the paper and the discussion on it. The use of electricity in the small towns is developing extensively, and we are finding that the figure of 1 kW for a house, or flat, it too low a figure to work on for planning distribution extensions.

Mr. H. J. GRIPPER (Port Elizabeth): Mr. President, I would like to add my thanks to Mr. Wrigley for his interesting paper which has provided much food for thought.

In developing the hypothetical network, care must be taken to consider the type of building in the area and in this connection I should be glad if Mr. Wrigley would indicate the practice in Salisbury in the case of what I would call three dimensional reticulation. I refer to buildings of several floors. Does the Supply Authority feed in at the ground floor only or are they prepared to instal metering positions on each floor?

The assumption that a 750 kVA transformer is a suitable size of unit for a given area strikes me as being somewhat large although the ultimate capacity might reach this figure and the initial transformer capacity might be of the order of 300 kVA. One must of course watch the matter from the point of view of our Councils' money as regards capital cost and the no load losses. It is probable that an economic area of supply from one substation or kiosk might be a hexagon approximately 700 yards across or say a circle of radius 350 yards. This area would cover approximately 150 half-acre plots when allowance is made for the area occupied by streets etc.

To my mind, however, the most important phrase in Mr. Wrigley's paper is: "That a Supply Undertaking has a duty to fulfil to its consumers". We certainly have a service to perform which is not merely the supply of electricity. Indeed a consumer would not recognize electricity as such nor would he know what to do with it unless he was provided with the necessary apparatus for its use and backed up by an efficient and obliging consumers' department of the Electricity Undertaking.

As I have stated in a memorandum which I have laid before our Executive Council, I consider that this Association has a very special duty to perform to take care of the interests of consumers as such and, among the many functions of this Association, it should provide a more effective clearing house for information on this subject in particular.

Mr. Wrigley has mentioned the possibility of increased revenue from an increase in voltage. I think his reference here should rather have been to a saving in loss.

References to increase in revenue toward the end of the paper and to conditions of capital restrictions etc., lead me to the topic of the necessity for increasing sales of electricity and to consider the Undertaking as a business proposition whether it be in the Municipal Area or in rural extensions. Here, as Mr. Halle has said, there should be no limit to our consideration of the number of kilowatts per consumer. The possibility of the increased use of radiators and space heating appliances, particularly in large office blocks etc., together with air conditioning equipment, indicate that there may be no end to the number of uses to which electricity may be put in the future. If one takes the comments in this morning's paper concerning the proposal to reduce the number of immigrants into considera-

tion, the Electricity Undertakings can at least contribute their assistance when it is realized that every unit of electricity supplied for power purposes will do the work of two, three or four men according to the circumstances of the case. We should of course continue to strive to sell more units per consumer but in doing so we may not be able to maintain a comparatively good load factor and the consumption or demand of a consumer may quite conceivably exceed four kilowatts in the near future.

Mr. J. E. MITCHELL (Salisbury): Mr. President, for obvious reasons I am not going to comment on the technical details of this paper. I do want to refer to a paragraph in the paper which is not in itself germane to the subject, but it gives me the opportunity, as it does in the Legislative Assembly during a budget debate, to speak about the President's valedictory address because the matter happens to be mentioned here. The point on which I wish to speak is that mentioned by Mr. Wrigley in his paper. when he states that "last year I was fortunate enough to be able to spend a few weeks at the Headquarters of the North Western Electricity Board in England, and see for myself what steps, if any, had been taken to unify the widely differing policies", and Mr. Fraser, in his valedictory address, mentioned that he felt that the time had come in this country to follow the lead given Overseas in the matter of an exchange scheme for technical personnel. Salisbury Municipal Council is quite enlightened in this respect, and Mr. Wrigley was granted the leave to visit the United Kingdom to obtain this experience and information.

I realize that such a scheme would be very difficult for some of the smaller Municipalities to operate, but it does occur to me that a similar scheme could be operated within South Africa. I see no reason why, for instance, an engineer of one of the smaller Municipalities, when proceeding on leave, should not have that leave extended for, say, fourteen days or three weeks, to allow him to visit one of the larger undertakings and to obtain valuable experience, and I sincerely hope that the Councillors present at this convention will take this idea back with them to their Councils. I am sure it will benefit all concerned, and will cost very little to operate.

Mr. R. M. O. SIMPSON (Durban): Mr. President, Mr. Wrigley, Gentlemen: This is my first attendance at an A.M.E.U. Convention and therefore the first time that I have had the opportunity of entering into a discussion.

I would like to join with the other speakers in thanking Mr. Wrigley for his very interesting paper. The problem he has discussed is one which is always exercising the minds of Distribution Engineers and the approach put forward by Mr. Wrigley is very interesting and certainly requires more time for study before a full discussion, to which a paper of this calibre is entitled, can be entered into.

There are a couple of points that I would like to comment on.

In applying formula on the economics of size, length and loading of feeders, variations in prices of metals and costs of losses will materially effect a layout which is suitable for present conditions.

The problem in Durban is handled in a very similar manner to that described by Mr. Downie of Cape Town, the methods adopted having been evolved by experience and study of the particular conditions experienced.

The siting and design of Transformer Kiosks is also one which presents many problems both aesthetic and technical and from the aesthetic point of view the suggestion to use outdoor substations would not be well received in Durban.

The question of operation of the transformers on the basis of an economical change point which, from the table given, is some point before full load, is interstting and requires further study before I feel I can comment on this proposal.

In conclusion I must again thank Mr. Wrigley for his most interesting paper.

PRESIDENT: If there are any further discussions, it would be advisable to allow the author to reply more formally, as he will not be able to reply to all the questions now. He can, however, reply briefly to some of the questions, if he

likes, he will be very welcome to do so. Mr. Wrigley, if you feel like replying now, you will be very welcome.

Mr. WRIGLEY'S REPLY TO CONTRIBUTIONS ON HIS PAPER.

Mr. President, Gentlemen: I am very grateful for the response to the paper, and I feel that the time I spent on it has been well worth while.

I cannot agree with Mr. Downie that there is no parallel between overhead distribution networks and the treatment given to theoretical cable layouts. I agree that the calculations and costs may differ slightly but the principles remain the same.

With regard to the loading density of an area, I am pleased to hear that good use is made of the Town Planning authorities in Cape Town. Salisbury too, has the problem of residences being demolished to make way for blocks of flats; this problem is catered for in the Supply Regulations where a consumer, whether industrial or domestic, may be called upon to provide a substation to the Department's specifications, if a load in excess of 50 kW is anticipated.

I do not favour the idea of departing from the ring main fed substation. Such a departure has an economic appeal at the expense of consumer service, for I question whether an L.T. network could be designed to carry an adjacent area satisfactorily over the period of a transformer or associated cable fault without spending as much money as would have been required to provide an H.T. ring feed initially. Furthermore, it would appear that the electricity consumer in Cape Town is entitled to special consideration if he is to provide an annual contribution of £400,000 towards relief of rates.

On the question of steel kiosks — in Salisbury substation sites are generally situated away from road frontages at the back of the property. Consequently they are away from general view. The design is such that there have been few complaints from the public and none from the Town Planning authorities. If necessary the kiosk can be screened with a hibiscus hedge or with cyprus trees in the same manner as Pietermaritzburg apparently deal with their out-door substations. For the economist, the cost of a steel kiosk to take a 750 kVA transformer is approximately half of a corresponding brick building, and the fault level on the L.V. side of such a transformer under the worst conditions in Salisbury does not exceed 15 MVA.

The remarks on A.D.M.D.'s by Mr. Fraser are interesting. Since returning from the Convention the winter peak has occurred in Salisbury, and this year the A.D.M.D. per consumer of a housing estate was 4 kW without ripple control on water heaters, and 3.1 kW with ripple control, which would tend to bear out that loading estimates taken are not far from the truth.

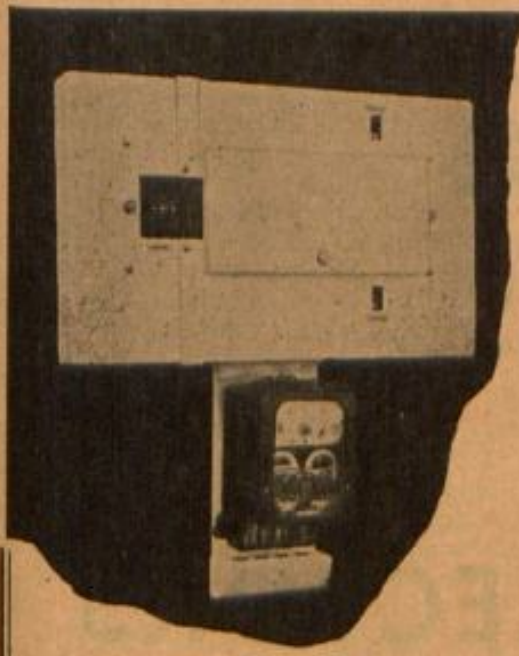
I am inclined to agree with Mr. Fraser that in the majority of cases in South Africa, voltage regulation will be the limiting feature, but as the building densities per acre and therefore the loading density increase this might not always be so.

I do not think that air conditioning plants will materially affect the A.D.M.D. per consumer. Obviously the type of equipment will be with us before very long, but I feel that its main function will be to increase the overall load factor without interfering with the peak as its use will not generally be coincidental with the present domestic peak.

In answer to Mr. Gripper's question I would say that no vertical reticulation is undertaken in Salisbury, where the supply authority feeds in only at the ground floor. In some cases the authority is prepared to allow metering positions on floors other than the ground, but the authority is not responsible for the rising mains.

I concur fully with Mr. Gripper's remarks on consumers service, for I feel that all the problems undertaken by a distribution department must be tackled with the consumer in mind. By such action a department can feel that it is doing a useful and appreciated job of work, and an atmosphere can be created which will be helpful in staff problems.

As my comments have been of general interest, I was wondering whether some arrangement might be made between the British Electricity Authorities and this



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organization, whereby reports similar to the ones on which I have based this paper can receive wider circulation. Perhaps the executive might feel that something could be done about this matter.

Once again I would like to thank you very much for the general response, and I am very pleased to have had the opportunity of drawing up this paper, and answering a few of your queries.

PRESIDENT: Gentlemen, I have been asked whether it would be possible to adjourn for a few minutes to watch the March Past at 11.25 a.m. when the Mayor will take the salute. Apparently a few of the members have sons who are taking part in the March Past. We shall now adjourn for 15 minutes.

PRESIDENT: Gentlemen, I would just like to make it very clear as to which members are expected to attend the Executive Meeting in the Committee Room at 8.30 to-morrow morning.

Towns: Bloemfontein, Pretoria, Cape Town, Springs, Krugersdorp, Pietermaritzburg, Salisbury and Port Elizabeth.

We can now proceed with the work of the Convention, and in order to catch up with yesterday's backlog in respect of the reports of the Sub-Committees, we will start with the report of the Coal Supplies Sub-Committee. I would like to say quite a lot about coal supplies! (*Laughter*) We expect a statement from the General Manager of Railways on this subject. Mr. Downie of Cape Town, will report on this matter.

COAL SUPPLIES 1953/54

C. D. DOWNIE (Cape Town)

The Statement on Coal Supplies presented to the Convention in Johannesburg last year referred briefly to the difficulties which those Electricity Undertakings, possessing Coal fired Power Stations, had experienced in the past in obtaining regular supplies of Coal and maintaining reserve stocks for the production of Electricity. Reference was made to the coal shortage crisis of the winter of 1951 which, following the appointment by the Government of a Coal Shortage Commission, resulted in the setting up of a Coal Allocation Committee whose terms of reference now are:—

1. To go into the question of the requirements and supply of coal to Power Stations and the South African Railways.
2. To act in a co-ordinating capacity between the various interests concerned to ensure that any disabilities are brought to the attention of those involved.
3. To deal with any question connected with the supply of coal referred to it by the Government.

Since it first met two years ago the Coal Allocation Committee has had 34 meetings at each of which the Association of Municipal Electricity Undertakings has been represented.

In so far as members of this Association possessing Power Stations are concerned it can be said that their coal requirements, on the whole, have been catered for satisfactorily during the past 12 months.

"Both the Coal Mining Associations who produce the Coal, and the South African Railways and Harbours Administration who transport it to the Power Stations are fully alive to the need of power stations (with the Railways themselves) to be accorded priority in supplies of coal required for the production of electricity."

The Coal producing Associations are aware of the requirements of Power Stations not only in regard to quantity, which increases from year to year, but also in the matter of endeavouring to produce the coals for which Power Station boilers were originally designed. To that end crushers have been installed for the production of "smalls" and facilities for the "washing" of coal are being extended in order to improve grading and quality. This is of paramount importance in so far as Power Stations situated a long way from the coal producing centres are concerned. We appreciate very much what the Coal Producers are doing in that direction.

Our thanks are due also to the South African Railways and Harbours Administration by the way in which the Railways have managed to carry the coal to the

Power Stations despite the increasing demands being made upon Railway Services by Industries, Agriculture, Mining and other Interests. The co-operation of the System Managers and their staff in arranging for and expediting the delivery of coal at the Power Stations is again deserving of our appreciation and thanks.

Your representatives on the Coal Allocation Committee are mindful of their responsibility in making representations on behalf of Municipal Power Stations and in this connection can claim to have carried out their duties satisfactorily during the past twelve months.

That, gentlemen, is the position as it has been during the past twelve months. As far as the immediate future is concerned I can see no reason to doubt that, notwithstanding the heavy demands being made on the South African Railways, they, with the coal suppliers, will see the power stations safely through the coming winter months.

PRESIDENT: Gentlemen, the report is now open for discussion. As it would appear that everybody is happy, the report is accepted with thanks.

The next report is by Mr. Fraser on the WORLD POWER CONFERENCE.

Mr. J. C. FRASER (Johannesburg): There is very little to report this year.

WORLD POWER CONFERENCE

Mr. J. C. Fraser (Johannesburg)

The International Executive Council of the World Power Conference held meetings at Essen on 7th September, 1953, and at Düsseldorf on 8th September, 1953, during which business matters were discussed.

The following items appeared on the Agenda of these meetings:—

1. National Committees and Representatives 1952.
2. Annual Report 1952.
3. Transactions of the Sectional Meeting in India 1951.
4. United Nations.
5. International Bank of Reconstruction and Development.
6. International Chamber of Commerce.
7. U.N.E.S.C.O.
8. Union of International Engineering Organisation.
9. Brazilian Sectional Meeting 1954.
10. Statistical Year Book of the World Power Conference.
11. International Commission of Large Dams of the World Power Conference.

There was no meeting of the South African National Committee during the past twelwe months.

PRESIDENT: The next Sub-Committee we will deal with is the Registration of Electrical Wiring Contractors. Mr. Downie of Cape Town, will you kindly report.

Mr. C. G. DOWNIE (Cape Town): Mr. President, I have nothing to report on this matter except to say that amendments to the Wiremen and Contractors Act are now under consideration. Electricity Undertakings have submitted their comments on the Act with a view to having possible amendments made to it and we are now awaiting the results on consideration of these amendments.

PRESIDENT: Are there any comments: if not, the report is accepted with thanks. The next report is by our representative on the Electrical Wiremen's Registration Board — Mr. Fraser.

Mr. J. C. FRASER (Johannesburg): Mr. President and Gentlemen: As your representative on the Wiremen's Board, I have pleasure in announcing that the Chairman of the Board, Mr. Smit, is present with us this morning and he will give you a brief resumé of the Board's activities during the last 12 months.

I now have much pleasure in asking Mr. Smit to come forward and give you a brief resumé of the Board's activities.

REGISTRATION BOARD ELECTRICAL WIREMEN'S ANNUAL REPORT, 1953

Mr. R. N. F. SMIT (Chairman, Wiremen's Registration Board):

Membership and Meetings of Board

1. Messrs. R. N. F. Smit, J. C. Fraser, H. R. Townsend, T. D. Bowness and P. Sommerville continued their membership for the second year of the Board's term of office. Mr. E. E. Wentink joined the Board in April, 1953, in place of Mr. A. Elisio, representing wiremen, and in May, Mr. P. Somerville was replaced by Mr. D. J. Geyser, appointed by the Minister in terms of Section 3 (1) (b) of the Act.

2. Mr. R. N. F. Smit was re-appointed as Chairman for the year 1953.

3. The Board held eleven ordinary meetings and one special meeting, the latter for the purpose of discussing proposed amendments to the Electrical Wiremen and Contractors Act. The Examinations sub-Committee, consisting of Messrs. Smit, Townsend and Bowness, met on ten occasions.

Application for Registration

4. The attached Table I gives details of applications for registration considered by the Board during 1953, as well as comparable figures in respect of the previous thirteen years. In connection with the 458 applications submitted in 1953, the Board approved of registration in 20 cases on the ground of exceptional circumstances which justified exemption from the prescribed examinations. 387 applicants were accepted for examination: 17 applications were refused on account of insufficient documentary evidence of training and experience in wiring work, while in 34 cases the Board deferred its decision pending receipt of further supporting evidence.

5. Reference is made in Table II to the number of registration certificates issued. Of a total of 5,474 wiremen registered to date, exemption from the prescribed examinations was granted to 2,398, the majority of whom were at the inception of the Act already holders of wiring certificates or licences issued by suppliers and thus, in terms of Section 12 (1) (e), entitled to registration.

Examinations

6. The examinations held by the Board in terms of Section 10 of the Act, consist of two parts:—

Part A: a written examination; and

Part B: a practical test.

Part A is sub-divided into Section I dealing with the wiring Regulations and Section II with the theory of wiring. Candidates who have passed the National Technical Certificate Examinations II (Electricians II), are exempted from the written part of the Board's examinations, provided that they have obtained at least 50% of the maximum marks in the former.

7. An analysis of the 3,076 thus far successful in the examinations is given in Table III.

It will be noted that —

92 candidates were required to write Sections I and II only;

285 candidates were required to write Section I only;

393 candidates were required to do the Practical test only;

464 candidates were required to write Section I and to do the Practical test;

1,842 candidates were required to undertake the full examination.

8. Of the 2,683 candidates who have written Section I, 1,863 (69.4%) succeeded in passing at the first attempt, comparable figures in respect of Section II being 1,343 (69.4%) out of a total of 1,934, and in respect of Part B (the practical test) 2,559 (94.8%) out of a total of 2,699.

9. Figures relating to the written examinations held in 1953 and in respect of all practical examinations held to date are given in Tables IV and V respectively.

10. Four written examinations were held during the year, the proportion of

successful candidates being comparatively small, viz., 254 out of 613 (41.4%).

11. Eight practical examinations were conducted, and of the 325 candidates who attended, 294 (90.4%) passed.

Returns in Terms of Section 17 (2)

12. In terms of Section 17 (2) of the Act, every holder of a certificate is required to give notice not later than the 31st March of each year of his residential address and whether he continues to practice as a wireman. Section 28 makes non-compliance with these provisions a punishable offence. In Table VI details are given of the position in regard to these returns. It will be observed that at the end of 1953 only a small percentage (22.0%) had complied with the requirements of the Act in this respect.

Determination of Areas

13. During the year, the municipal area of Thaba'Nchu and the magisterial districts of Pietersburg, Stellenbosch, George, Knysna, Port Shepstone, Marico, Mafeking, Nelspruit and Wellington were determined by the Minister in terms of Section 18 of the Act as areas in which Sections 19 and 20 were to apply. Notices were published of the Minister's intention further to extend the areas thus covered by determining the magisterial districts of Montagu, Vredefort, Koppies, Robertson, Aliwal North, Standerton and Volksrust after the expiry of one year from the date of the relevant notice.

14. The Board is of opinion that the provisions of this Section of the Act should be systematically applied with the ultimate object of extending the scope to cover the whole Union. Given a sufficient period in which to prepare themselves for examination, no hardship would thereby be imposed on practising wiremen, and it is felt that in general such a step would be favourably received by suppliers and the public alike, since the public safety is the primary object of the Act.

Prosecutions

15. Section 19 (1) of the Act lays down that wiring work carried out in a determined area is to be supervised by the supplier. In six cases, legal action was taken against persons who failed to obtain the supplier's authority to perform the work.

Legal action was also taken against nine persons who contravened the provisions of Section 20, in that within determined areas, they carried out wiring work without being in possession of licences.

Three suppliers notified the Board that they had instituted legal proceedings in respect of contraventions of municipal electricity by-laws.

TABLE I

APPLICATIONS FOR REGISTRATION

Year.	Number of Applications considered by the Board.	Decisions of the Board.			
		Exempted from Examination.	Accepted for Examination.	Refused.	Deferred pending Receipt of Further Data.
1940	2,668		127	92	
1941	172		282	91	
1942	120		148	108	
1943	281		182	54	
1944	299		159	55	
1945	444	2,403	179	57	248
1946	721		418	93	
1947	625		603	78	
1948	730		634	62	
1949	569		503	39	
1950	460		338	122	
1951	372		349	37	
1952	509	27	417	43	22
1953	458	20	387	17	34
TOTALS	8,428	2,450	4,726	948	304

TABLE II

REGISTRATION CERTIFICATES

Year.	Registration Approved Applicants having been Exempted from Examination.	Registration Approved after Applicants had Passed the Prescribed Examination.	Total.
1940			725
1941			780
1942			193
1943			178
1944			208
1945	2,351	2,507	218
1946			350
1947			501
1948			418
1949			572
1950			433
1951			282
1952	27	256	283
1953	20	313	333
TOTALS	2,398	3,076	5,474

TABLE III

ANALYSIS OF 3,076 CANDIDATES WHO HAVE BEEN SUCCESSFUL IN THE EXAMINATIONS

Sections of Examination which Candidates were Required to do.	Number.	Section I: 2683 Candidates. Successful after Attempts.						Section II: 1934 Candidates. Successful after Attempts.						Part B: 2699 Candidates. Successful after Attempts.			
		1	2	3	4	5	6 or more	1	2	3	4	5	6 or more	1	2	3	4
Full examination, i.e. Sections I and II and Part B.	1842	1254	367	138	54	16	13	1281	333	139	55	19	15	1744	94	4	—
Sections I and B.	464	343	97	15	6	2	1							446	16	1	1
Part B only.	393													369	23	—	1
Section I only.	285	207	67	4	3	3	1										
Sections I and II.	92	59	19	6	3	4	1	62	17	9	1	2	1				
TOTAL	3076	1863 69.4%	550	163	66	25	16	1343 69.4%	350	148	56	21	16	2559 94.8%	133	5	2

TABLE IV

WRITTEN EXAMINATIONS, 1953

Number of notifications issued	1,442
Number of entrants	684
Number of entrants who failed to attend	71
Number of candidates who wrote the examinations	613

SUMMARY OF RESULTS

Section(s) of Examination which Candidates were Required to Write.	Number of Candidates.	Number of Candidates who Passed. Sections I and II	Section I	Section II	Failed.
Sections I and II	345	112	45	42	146
Section I	148		77		71
Section II	120			65	55
TOTAL	613	112	122	107	272

Number of candidates who by passing the written examination became eligible for the practical examination, or (if exempted therefrom) for registration		254	(41.4%)
No. of candidates who failed in one or both sections of the examination and were required to re-write —			
Sections I and II	146		
Section I	113	359	(58.6%)
Section II	100		

TABLE V

PRACTICAL EXAMINATIONS

Year.	Number of Examinations held.	Number of Entrants.	Number of Successful Candidates.
1942	2	50	49
1943	2	73	67
1944	3	130	123
1945	4	158	145
1946	7	249	229
1947	8	362	299
1948	7	249	227
1949	9	460	381
1950	9	393	347
1951	7	289	253
1952	8	265	242
1953	8	325	294
TOTALS	74	3,003	2,656 (88.4%)

TABLE VI

RETURNS IN TERMS OF SECTION 17 (2) OF THE ELECTRICAL WIREMEN AND CONTRACTORS ACT

1943–1953

Registered Wiremen. Cumulative			Returns Received to End of Year:-											Returns Received up to end of 1953. Cumulative	Cumulative
Year.	Number.	Total.	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	Total.	percentage.
1940	725	725	25	22	19	33	56	6	20	28	47	108	115	115	15.8
1941	780	1505	28	51	13	37	39	2	16	20	36	69	78	193	12.8
1942	193	1698	8	12	7	11	14	3	2	5	9	26	25	218	12.8
1943	178	1876	—	44	10	13	16	1	7	7	11	17	19	237	12.6
1944	208	2084	—	—	37	24	22	4	12	12	17	13	26	263	12.6
1945	218	2302	—	—	—	62	25	3	9	11	21	21	20	283	12.2
1946	350	2652	—	—	—	—	92	6	10	15	25	41	45	328	12.3
1947	501	3153	—	—	—	—	—	14	34	33	39	104	112	440	13.9
1948	418	3571	—	—	—	—	—	—	107	37	37	93	91	531	14.8
1949	572	4143	—	—	—	—	—	—	—	176	68	130	143	674	16.2
1950	433	4576	—	—	—	—	—	—	—	—	104	186	167	841	18.3
1951	282	4858	—	—	—	—	—	—	—	—	—	164	145	986	20.3
1952	283	5141	—	—	—	—	—	—	—	—	—	—	145	1131	22.0
	5141		61	129	86	180	264	39	217	344	414	972	1131		

Mr. Downie of Cape Town, referred to the amendments. They are, as he stated still under consideration. Regulation 19 which the Board had decided to amend straight away, is being dealt with now. As you know, apprentices can now qualify after 4 years provided they have passed the examination. The Board's examination is considered the qualified examination, in this respect, but Regula-

tion 19 lays down that an applicant for examination must be not less than 20 years of age. We have decided to cut that out. If an applicant wishes to write the examination at 17 or 18 years of age, he can do so, but we do not intend to amend Section 12, which reads, "any person who satisfies the Board that he is not less than 20 years of age", that is not going to be omitted, which means a boy under 20 can write the examination, but he cannot obtain registration until he has obtained the age of 20 years. I think that is all I have to say.

PRESIDENT: We are grateful to you, Mr. Smit. Is there any comment on the report, Gentlemen?

Mr. H. J. GRIPPER (Port Elizabeth): Mr. President, I should be glad if a representative of the Electrical Wiremen's Registration Board would enlighten us upon a question which has recently arisen in our area and that is the registration of Africans as Wiremen. Africans have applied to be registered as Wiremen, to be permitted to wire Native Houses. What is the policy of the Board in this connection?

Mr. J. C. FRASER (Johannesburg): In answering Mr. Gripper's question, I may state that under the Electrical Wiremen and Contractors' Act there is no Colour Bar. Coloured or European applications for a licence will be dealt with on their merits. In answer to the question of wiremen-natives — practising in native areas under the Building Workman's Act, I understand that this is possible. As your representative on the Board, I think I may say, there was one case where a native applied for a licence; if I remember correctly, he was accepted for the Examination, but whether he passed or not, I do not know.

The point is that if an African applies for a licence, his case will be dealt with on the same lines as a European.

Mr. C. LOMBARD (Germiston): I believe that at this time when amendments to the Electrical Contractors and Wiremans Act are being considered, everything possible should be done to enable more men to qualify as wiremen. As mentioned by Mr. Smit, more and more areas throughout the country are becoming determined areas in terms of the Electrical Wiremen and Contractors Act.

As the Act is today, no person, even though he may be a qualified electrician, may do any wiring even under the supervision of a licensed wireman, unless he falls under one of three categories, that is, he must be either an apprentice, an improver or a registered wireman.

There is the practical difficulty that electricians who have served their apprenticeships and have been employed on mines may wish to qualify as wiremen. If they have not had sufficient wiring experience they are not allowed to take the examination for a wireman's licence and in terms of the Act, are also not permitted to do wiring work in determined areas under the supervision of registered wiremen in order to gain the necessary wiring experience. I feel that it would be a good thing if such cases could receive special consideration and provision can perhaps be made for Electrical Engineers to use their discretion in cases like these.

We all know that there is a shortage of wiremen and I feel that if we want more wiremen, we must make it possible for them to get the experience to qualify.

PRESIDENT: Perhaps Mr. Smit would like to give an opinion on the point raised by Mr. Lombard.

Mr. R. N. F. SMIT: Mr. President, Mr. Lombard, Gentlemen: I do not think there will be any difficulty if a person works for a year under the supervision of a qualified wireman. He can then obtain a fair amount of wiring experience.

Mr. C. LOMBARD (Germiston): Must they work as improvers and then switch to wiring?

Mr. SMIT: I would not care to express an opinion at the moment. I would rather speak about that later on.

PRESIDENT: Any further discussion?

Mr. D. A. BRADLEY (Port Elizabeth): Mr. President, Gentlemen: I cannot really say that, from experience, a man who has served his Apprenticeship with a good Firm or Company — not necessarily Wiring Contractors — is not

a good enough man to undertake Wiring Work. I think some arrangement should be made whereby an applicant for a Wireman's Licence — having served a full Apprenticeship to the Trade — be given a Temporary Licence for a stated period, wherein to prove his ability, and, if necessary, sit for the examination, rather than that he should have to transfer to an undetermined area and work for some time before he could qualify to apply for a Licence. That is the very important point Mr. Lombard raised, I think.

Mr. R. N. F. SMIT: Gentlemen: Every application is considered on its merits. If the Board has sufficient evidence before it to say that any particular applicant has had ample experience of wiring work, he is given the opportunity to prove it. Every application is treated on its merits, I can assure you on that point.

Mr. F. STEVENS (Kimberley): I would like to associate myself with Mr. Bradley's remarks. With regard to what Mr. Smit has just stated, I often wonder whether the Board is in a position to decide, not having seen an applicant, whether he should be permitted to operate as a wireman. To have seen and questioned the man, I think, makes a big difference.

Mr. J. L. VAN DER WALT (Krugersdorp): Mr. President, Mr. Lombard's first point has not been clearly understood. I believe that a certain magistrate has ruled that a person is under constant supervision if he is visited by the Supervisor once an hour, day, week or even month. The term "constant supervision" needs better defining.

Mr. K. W. J. HALLIDAY (Port Shepstone): Gentlemen, Constant Supervision is a very important matter. In my area I consider constant supervision to imply that the Supervisor must be in continuous attendance at the installation whilst work is being performed — it is not enough for the licensed electrician to check over the work after it is completed, as in that case he is simply a preliminary inspector.

PRESIDENT: Perhaps Mr. Fraser can reply to a few of the remarks.

Mr. J. C. FRASER (Johannesburg): Mr. President, I will endeavour to answer the queries put forward.

The Act states that a person not certificated must work under the continuous supervision of a registered wireman and the Board has no power to alter the Act.

Amendments are now being considered and it is possible that this section will be amended.

The case which was reported to the Board, went to Court and the Magistrate gave a ruling which could not be accepted by the Board.

In Johannesburg we say that in continuous supervision, the registered wireman must be prepared at a moment's notice to give his advice on the job.

If we take for instance the wiring of a block of flats — the person who is supervising must be on the job. It is not good enough for him to supervise two or three blocks of flats at the same time.

Until the Act is altered, continuous supervision must apply.

If there is any other point, I am willing to help where I can. I would now like to take the opportunity of thanking Mr. Smit for the efforts he has made during the year, and will be pleased if he would kindly convey to his organization our thanks. He has a very able staff, who interest themselves in the Board's work and have done a good job of work, so will be glad if our thanks could also be conveyed to them.

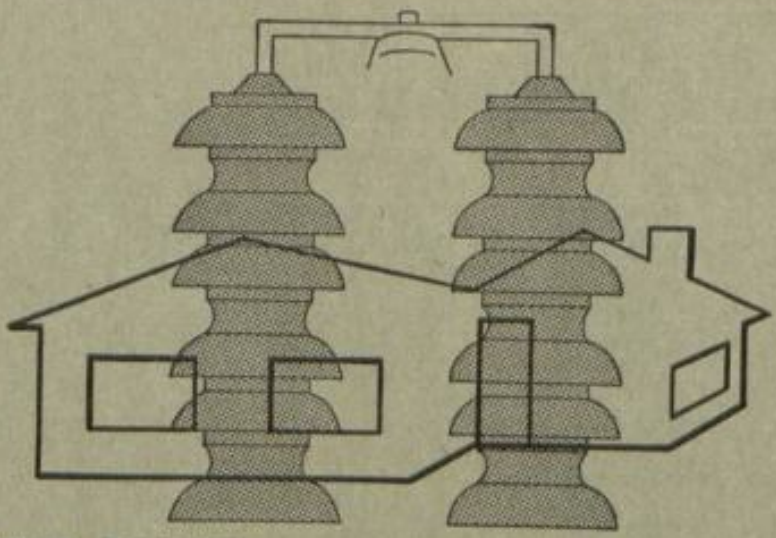
PRESIDENT: With those remarks, we can now accept the report and carry on with the next report.

Our representative on the S.A. Bureau of Standards is Mr. Van der Walt, of Krugersdorp.

THE SOUTH AFRICAN BUREAU OF STANDARDS

Mr. J. L. VAN DER WALT (Krugersdorp):

The following is a list of Codes of Practise and Specifications which are alterations and additions to the list published in the Proceedings of the May, 1953 Convention.



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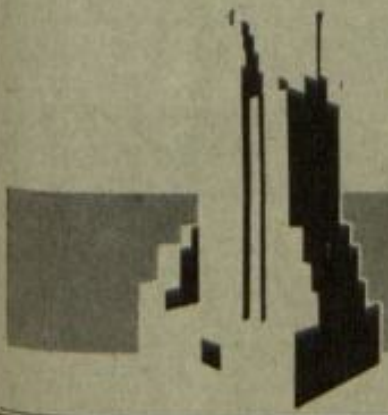

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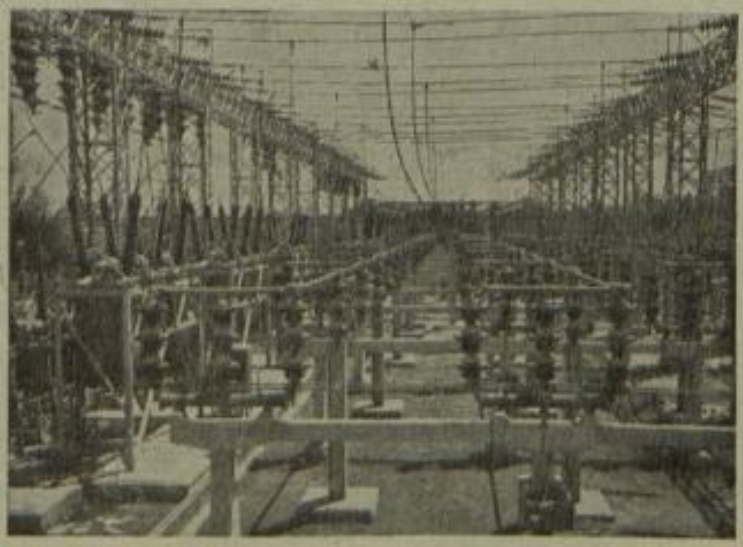

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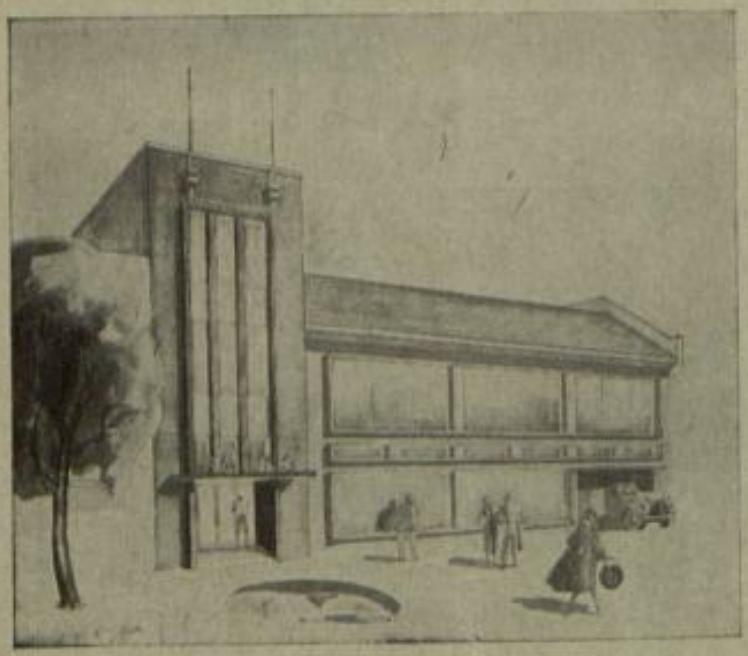

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(a) Codes of Practice

1. Code of Practice for the prevention of deterioration due to tropical conditions 046–1952
2. Protection against lighting (Revision finalised) 03–1952

(b) Safety Specifications

1. Apparatus connectors for portable domestic appliances .... SV.121-1950 (amended)
2. Lampholders and bayonet lampholder adaptors .... SV.119-1950 (amended)
3. Portable electric immersion heaters SV.102-1953

(c) Quality Specifications

1. Two Pole and earthing-pin plugs and socket-outlets 164-1953
2. Vulcanised rubber insulated cables for telecommunication and signalling purposes 169-1953
3. Flameproof enclosures for Electrical apparatus 314-1951

IN THE COURSE OF PUBLICATION

(a) Safety Specifications

1. Flexible cords for power and lighting purposes SV.104-1953
2. General requirements for portable domestic and industrial electrical appliances SV.100-1953
3. Portable appliances for heating liquids SV.107-1953

(b) Quality Specifications

1. Flexible P.V.C. Compounds for electrical purposes 175-1953
2. Apparatus connectors for portable domestic appliances 167-1953

UNDER REVIEW FOLLOWING COMMENTS

(a) Safety Specifications

Electric heating pads and blankets.

(b) Quality Specifications

1. Cartridge type fuse-links for low and medium voltage electric fuses.
2. Cartridge type electric fuses for low and medium voltages, excluding fuse links.
3. Immersion type thermostats for electric storage water heaters.
4. Lampholders.
5. Rewirable type electric fuses for low and medium voltages.
6. Reinforced Concrete poles for telegraph, telephone, power and lighting purposes.

IN THE COURSE OF PREPARATION

(a) Quality Specifications

1. Copper wire and bar for the manufacture of electrical conductors.
2. Insulating tapes.
3. Letter symbols and abbreviations.
4. Intrinsically safe electrical apparatus.
5. Memorandum on the Giorgi or M.K.S. system of units.

There is also under consideration the drafting of specifications for Power Transformers, Induction motors, Wall Outlet Boxes and Switch Cover Plates.

It is quite clear that the year under review has again been an active one.

(b) Safety Specifications

It is to be noted that the safety specification, General requirements for portable domestic and industrial appliances, SV.100-1953 is now in the course of publication. This takes us a big step nearer the completion of all safety specifications under consideration.

The Minister of Economic Affairs has agreed *in principle* that the following nine Safety Specifications be promulgated, so as to become compulsory on the lines

reported before. The specifications will be gazetted. Three months will be allowed for objections, and the specifications will then come in force after a time limit stated opposite each specification. It is estimated that the first promulgation will appear in approximately six months time.

SV.101-1953—Manually operated air break switches ..... 1 year.
SV.102-1953—Portable electric immersion heaters ..... 1 year.
SV.103-1953—Electric air heaters and radiators ..... 1 year.
SV.104-1953—Flexible cords for power and lighting purposes ..... 1 year.
SV.107-1953—Portable appliances for heating liquids ..... 6 months.
SV.109-1953—Plubs, socket outlets and socket outlet adaptors ..... 1 year.
SV.112-1953—Electric Hand-lamps ..... 1 year.
SV.117-1953—Electric stoves and hot-plates ..... 1 year.
SV.121-1950—Apparatus connectors for portable domestic appliances 1 year.

Your Association has again been prominent in the drawing up of most of the specifications listed, for which thanks are due to the Reef, Johannesburg and Pretoria members for their willingness to secrifice their valuable time in attending technical drafting committee meetings.

Your Association, through its Executive Council Members, have also been given the opportunity to comment on such important international matters as:—

Commonwealth Conference on Electric Cables.
Draft Recommendations — Extra High Voltages.
Draft Recommendations — Standard for Power Transformers.
Draft Recommendations — Determination of Efficiency of Rotating Machinery.
Draft Recommendations — Capacitors for Power Systems.
Draft Recommendations — Electric Cables.

To the Director and Staff of the Bureau, we can only say: Thank you for the valuable work you are doing for the Country and this Association.

Our thanks are due to Mr. Downey of Springs for keeping the Association represented on most committees.

PRESIDENT: I think the representative of the Bureau of Standards might have something to add to this report.

Mr. J. W. SWARDT (S.A. Bureau of Standards): Mr. President, Gentlemen: The first point I should like to draw your attention to is the reference to S.A.B.S. standards by manufacturers. In terms of the Standards Act, a manufacturer is not permitted to claim compliance with a S.A.B.S. standard unless he can apply the S.A.B.S. mark to his product under a permit issued by the Council of the Bureau. The only exception to this is that such a claim can be made when tendering or contracting to an enquiry for commodities to be supplied to a S.A.B.S. standard. This is somewhat different to what Mr. Van der Walt has stated.

The other point I would like to mention is an item in the list of proposed standards mentioned by Mr. Van der Walt, viz. Distribution transformers — this I feel is very important. In our talks with transformer manufacturers from time to time we have been impressed by the large variety of specifications used by customers and the difficulties experienced by manufacturers in persuading customers to accept what is considered a good type of transformer. This proposed standard will, I think, be completed in the ensuing year and we would like engineers to help us when the draft is circulated for comment by giving us your views on the proposed standard. Many engineers have their own ideas of how transformers should be manufactured but it is now time that these ideas should be rationalized. It can only be to your advantage to have a standard embodying the most acceptable designs and performances.

Finally I would like to mention the safety specification for electrical appliances. You will recall that this Association passed a Resolution in Bulawayo that all 17 safety specifications be declared compulsory by the Minister of Economic Affairs. On studying the effect of this resolution, we chose what we con-

sidered the most important specifications to be made compulsory initially. We chose nine specifications of which five cover appliances, viz. Portable Electric Immersion Heaters, Electric Air Heaters and Radiators, Portable Electrical Appliances for Heating Liquids (i.e. Kettles etc.), Electric Handlamps, and Stoves and Hotplates. The remaining four specifications cover the attendant accessories, i.e. Manually Operated Airbreak Switches, Flexible Cords for Power and Lighting Purposes, Plugs, Socket Outlets and Socket Outlet Adaptors, and Apparatus Connectors for Domestic Appliances. The Minister is giving the matter close consideration at the moment but we do not know how soon a decision will be reached.

I would like to express my appreciation on behalf of the Bureau for the excellent response we have received from your organization. Your representatives have been most willing and helpful, and we can assure you of any further assistance which you may require from us.

Mr. R. N. F. SMIT (Chief Inspector of Factories): On behalf of my department I would like to express our appreciation of the work done by the Bureau of Standards.

They have been very useful to us indeed and they are particularly useful to us with regard to preparing standards for protective appliances required under the Factories Act.

PRESIDENT: Mr. Fraser says he will be very short with his report on Overhead Lines, so we will deal with that report.

OVERHEAD LINES : CODE OF PRACTICE

J. C. Fraser (Johannesburg)

There have been no further developments in the matter of the proposed amendments to the Overhead Lines Code of Practice since I reported at the last Convention. Comments from two Municipalities have been passed to the South African Institute of Electrical Engineers for the attention of the responsible committee.

PRESIDENT: Gentlemen, we shall now adjourn until to-morrow morning at 9.30.

THIRD DAY

THURSDAY — 13th MAY, 1954

9.30 a.m.

PRESIDENT: Gentlemen, before we start with the work of the Convention, I have a few announcements to make.

I have been approached by a few members — engineers — who would like extra copies of the technical papers. Unfortunately we have no more copies available. If there are members who would like to donate copies, I shall be very pleased.

FACTORIES REGULATIONS

PRESIDENT: As a result of a communication from the Post Office Engineering Staff, I would like Mr. Fraser to amplify his report on Overhead Lines.

Mr. J. C. FRASER (Johannesburg): Mr. President and Gentlemen: Our Secretary circularized the information he received in a letter from the Chief Inspector of Factories, dated 26th January, 1954, which reads as follows:—

"The Postmaster-General has requested this Department to amend Regulation 81 to the following extent:-

(1) By the substitution in sub-reg. (aa) of 30' for 25'.

(2) By the substitution in sub-reg. (bb) of 22'6" for 20'6".

(3) By the substitution in sub-reg. (cc) of 21'6" for 19'6".

The Postmaster-General is of opinion that these amendments are necessary in view of the increasing use of high tension overhead mains within townships, and also on account of the increasing use of tele-communications which necessitate the fitting of extra cross arms to existing poles, thus increasing the height of the postal telegraph and telephone lines.

I should be glad to have your Association's view on the matter."

Subsequently, the appended memorandum was submitted to the Executive Council by the Postal Engineering Officials.

SECT. 81. HEIGHT OF CONDUCTORS.

(1) The minimum height from the ground of electric conductors and other wires, except in the case of electric trolley wires and overhead service mains, shall be as follows:—

(a) Within all Townships —

(i) eighteen feet, except where otherwise specified;

(ii) twenty feet from the rails at all railway crossings;

(iii) at telegraph crossings, twenty-one feet unless the Chief Inspector otherwise directs, provided that —

(aa) at road crossings where important telegraph lines, such as trunk and junction lines, are also crossed, the supplier shall not be required to provide a greater clearance than twenty-five feet from the ground;

(bb) at road crossings where electrical supply lines cross over unimportant telegraph lines which are constructed of bare wires, the supplier shall give at least eighteen inches clearance between the electrical supply line and the telegraph line, but shall not be required to provide protective devices or give a greater clearance above ground than twenty feet six inches, provided that all parts of the crossing and adjacent spans of the supply line have factors of safety fifty per cent. in excess of those laid down in these regulations for standard construction;

(cc) at all other telegraph crossings, such as drop wire telephone services, the supplier shall not be required to provide protective devices or give a greater clearance than nineteen feet six inches from the ground.

Proposed Amendments to Above:

SECTION 81.

(1) The minimum height of electric conductors and other wires from the ground except in the case of electric trolley wires and service lines, shall, unless the Chief Inspector directs otherwise, be as follows:—

(a) Within all Townships —

(i) Eighteen feet, except where otherwise specified;

(ii) at all railway crossings, 20 feet from the rails;

(iii) at proposed crossings of existing telegraph routes, the clearance specified by the Postmaster-General —

(aa) At points where projected important telegraph lines, such as trunk and junction lines, are to be crossed, the supply undertaker shall not be required to provide a greater clearance above ground than 27 feet plus the minimum outdoor earth clearance applicable to the supply line.

(bb) At points where projected unimportant telegraph routes which will be constructed of bare wire are to be crossed the supply undertaker shall not be required to provide a greater clearance above ground than twenty-three feet six inches plus the minimum outdoor earth clearance applicable to the supply line. All parts of the crossing and adjacent spans of the supply line must, however, have factors of safety 50% in excess of those laid down in these regulations for standard construction.

(cc) At all other projected telegraph crossings such as drop wire telephone services the supply undertaker shall not be required to provide a

greater clearance above ground than twenty-one feet six inches plus the minimum outdoor earth clearance applicable to the supply line.

These proposed amendments brought in a number of objections from our members and your Executive has been going into these objections and representatives of the Post Office Engineering Staff were invited to attend the Executive Meeting. The outcome of the discussion is that these heights were actually embodied in the Overhead Lines Code of Practice which was issued two to three years ago, and these heights were recommended by the Engineers who sat on the responsible committee.

After due consideration your Executive feels thas these heights should be included in the Factory Act, and your Executive recommended that you accept the new heights.

PRESIDENT: Gentlemen, in view of the correction do you agree that we have no objection to the amendment which affects you in some way — if you have an objection please say so.

THE MEETING AGREES

PRESIDENT: Kokstad has an item on the quiz this morning which has been before us before, and apparently the matter has not been solved yet. Mr. Thackwray has quite a bit of information. Those of you who are interested in the discussion could see Mr. Thackwray during tea time.

As you all know, Mr. Sibson is leaving for England next week, and we would be pleased if Mr. Sibson could represent us at the British Electricity Power Convention. Would you all support our wish in that respect.

YES, EVERYBODY AGREED.

We shall now proceed with the next item on our Agenda this morning, which is the paper by Mr. Hafele.

"SOME DESIGN FEATURES OF THE NEW THERMAL POWER STATION FOR THE CITY OF BLOEMFONTEIN," by C. F. Hafele, B.Sc.(Eng.), A.M.(S.A.)I.E.E.

Introduction

The existing Power Station of the City of Bloemfontein has been extended periodically throughout the past years as the electrical demand so required and in 1947 during the installation of the last turbo-alternator, No. 6, it was decided to examine the question of building a new power station adjacent to the existing station in order to meet future load which was then considered to be increasing at the rate of some 12% per annum.

This general rate of increase of load estimated for the period up to 1960 indicated that the most suitable size of set would be either 10 or 15 MW. After further consideration it was decided to install six 10 MW sets with eight 10 MW boilers to permit all machines to be steamed at M.C.R. whilst boiler maintenance was in progress and whilst forced boiler outage could be catered for. During the later development of site layout drawings it was found that seven such sets could be installed, the number of boilers, however, remaining at eight, thus permitting station operation at M.C.R. with either boiler maintenance in progress or forced boiler outage, but not both.

In order to meet immediate load demands it was agreed to proceed with the first two sets with three boilers and so, in 1949, designs and specifications were drawn up covering the first section of the station.

Orders were placed for the plant in 1951 and 1952 and erection is now proceeding and it is hoped that the first machine and boiler will be commissioned at the end of 1954 or very early in the following year.

In 1953 a further investigation into load growth and plant requirements was made and it was found that, partly owing to a revision in the S.A.R. & H's requirements for electrical power, the actual load in

1957 would exceed the earlier estimated figure for that year by about 6 MW. To meet the extra demand in the immediate future it has been decided to order immediately a further 10 MW set with boiler and auxiliary equipment and work is proceeding on these lines.

To make the most of the area available for this station it has also been proposed to increase the size of future machines after the third 10 MW set and three 15 MW sets are planned to be installed instead of four 10 MW sets originally proposed, thus increasing the final station capacity from 70 to 75 MW.

Certain interconnections between the existing station and the new have been made in order to improve operation of the former and these consist of steam and condensate systems, coal handling plant and circulating water and, of course, electrical interconnection. Each of these interconnections is dealt with separately under their respective headings.

Site

There was considered to be sufficient room adjacent to the existing Power Station in Zulu Street for the size of station envisaged, although further land was purchased for accommodating the coal handling plant and cooling towers. The present Power Station is served by a siding connected with the South African Railways System, some 1,500 ft. or more to the south of the Power Station and an advantage of extending adjacent to the present Station was that this siding and the new coal handling plant to be installed could also be arranged to serve both Power Stations.

General Particulars of Power Station

The plant layout is shown on Plate I and includes for a turbine house parallel to Zulu Street, the boiler house being adjacent with no partition wall between the two. The machines are arranged longitudinally and the boilers are side by side. An office block incorporating control room and switch-house is provided on the Zulu Street boundary and this block is connected with the Power Station turbine house by means of an overhead bridge. The C.W. pumphouse is adjacent to the office block.

The cooling towers are sited on land purchased specially on the opposite side of Harvey Road and are connected with the Power Stations by underground culverts.

General particulars of the plant to be installed are shown in Table I.

Civil Works

Before any work could commence on construction of the new Power Station,

Table I

General Particulars of Power Station

Description	First Section	Second Section	Future Section	Total
Year of Design	1949	1954	—	—
Year of Commissioning	1954/5	1957	—	—
Installed Capacity (MW)	20	10	45	75
Steam Pressure (lb./sq. in.)				
Boiler Stop Valve	425	425	425	—
Turbine Stop Valve	400	400	400	—
Steam Temp. (°F)				
Boiler Stop Valve	825	825	825	—
Turbine Stop Valve	800	800	800	—
No. and Capacity (MW) of Turbo-Alternators.	Two	One	Three	Six
M.C.R.	10	10	15	
E.R.	8	8	12	
No. and Capacity (k.lb. of steam/Hr. of Boilers.	Three	One	Four	Eight
M.C.R.	110	110	130	
E.R.	88	88	104	

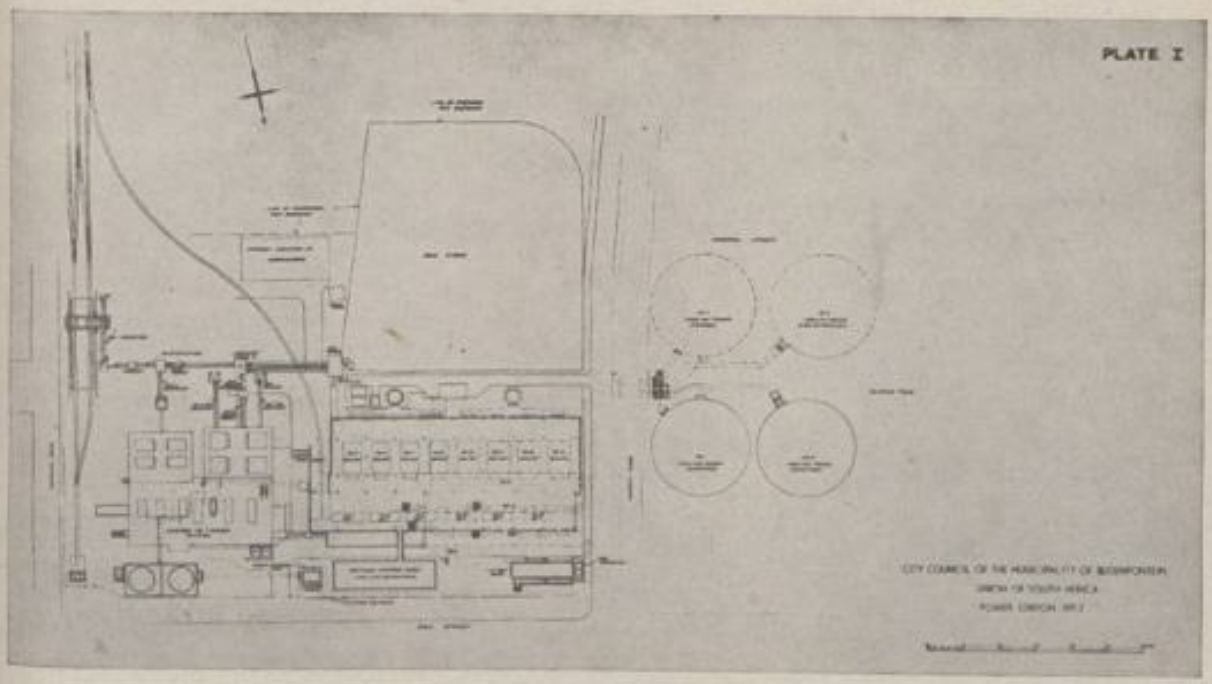


PLATE I.

the old spray ponds previously used by the existing Power Station had to be demolished. This work commenced in November, 1952, and was completed some two months later when work was started on the main foundations for the new Power Station.

As the site is founded on the Beaufort Shale series, the foundation work consisted simply of filling sufficiently large excavations with concrete around the stanchion bolts. The floor slabs are lightly reinforced and are laid over the stanchion bases resting on rock and hardcore backfill.

The chimney, which is of reinforced concrete construction, is to be 250 ft. high and is provided with 4½" firebrick lining. The shell and lining are so arranged that a constant flow of cooling air separates them. The crown on the chimney is protected by a cast iron ring built up in segments. Access is obtained by a ladder with protective cage and resting landings.

The circulating water culverts are in reinforced concrete with splayed corners and are heavily reinforced for internal pressures.

Power Station Buildings

The main Power Station buildings incorporating the turbine house, boiler house and boiler house annexe are all steel framed brick clad type with 13½" brick walls. There is no division wall between the boiler and turbine houses and the operating floors for both are the same (+ 18 ft. above basement floor level). This arrangement is being adopted quite widely in many Power Stations planned in recent years.

The clothing is so designed that the external architectural appearance of the buildings is in brick with window and door cills and mullions in plastered concrete.

An Architect's impression of the completed station is shown in Plate II.

The turbine house is provided with an electric overhead travelling crane of 80,000 lb. capacity which is suitable for lifting the heaviest parts of future larger machines. The crane is fitted with an auxiliary hoist of 16,000 lb. capacity for lifting smaller sections of plant without the inconvenience of using the main hook.

A cross section through the station buildings is shown on Plate III.

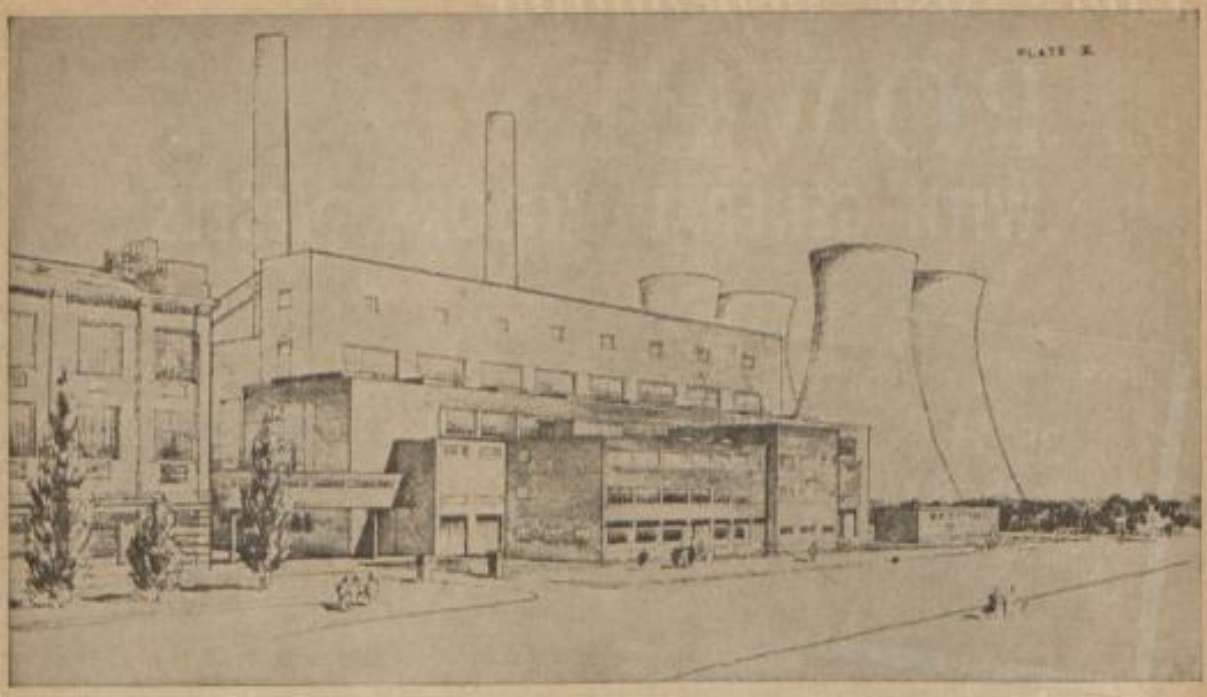


PLATE II.

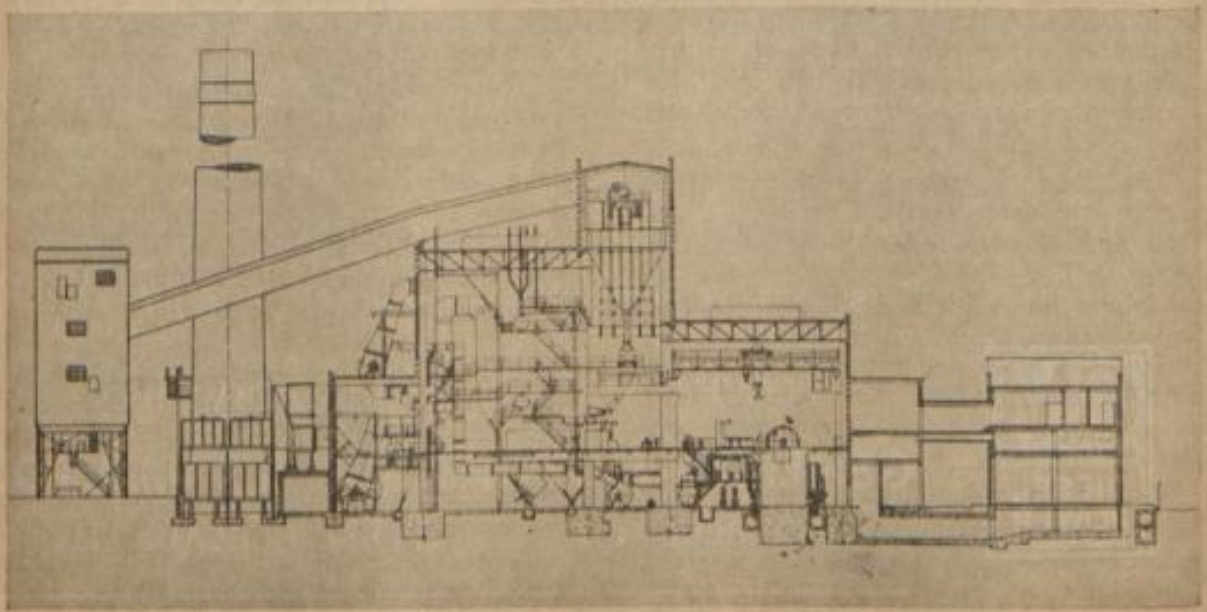
The turbine house operating floor is of concrete construction with light-wells beside each machine and removable covers over such items of plant as oil coolers, etc., for providing crane facilities.

The elevated coal bunkers are immediately above the firing aisle in the main bunker bay.

The boiler house operating floor and firing aisle are also of concrete construction.

In order to reduce the amount of steel used in the framework to a minimum, the utmost care has been taken to design the steel frames economically. To assist in achieving this all roofs are of light

PLATE III.



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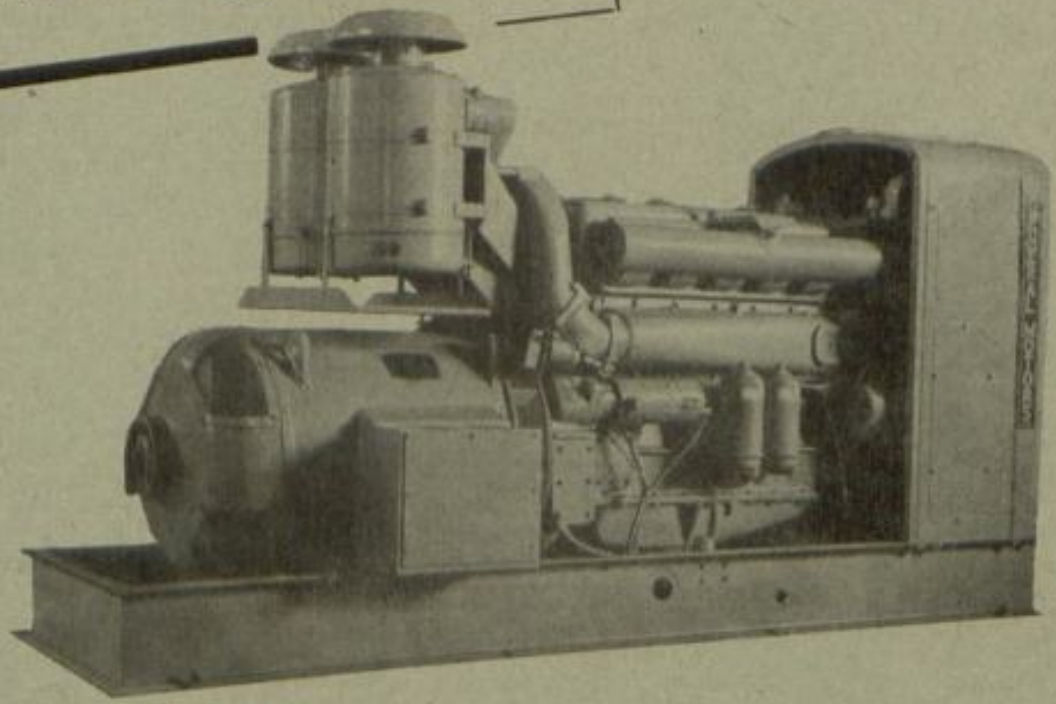

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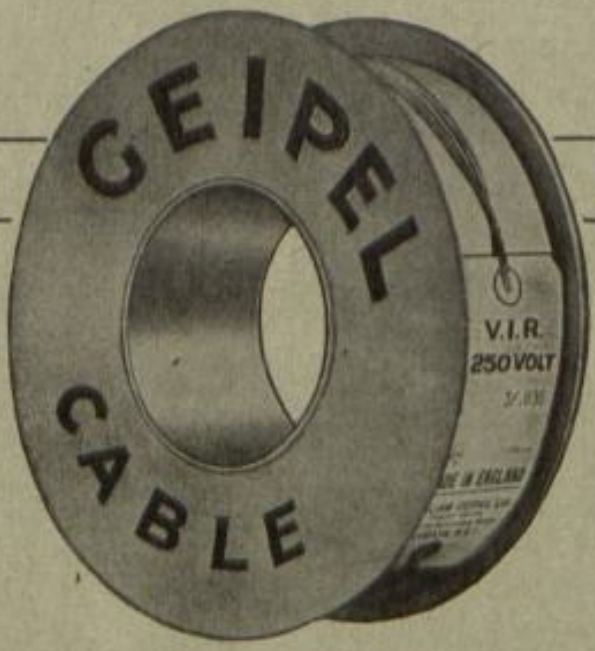

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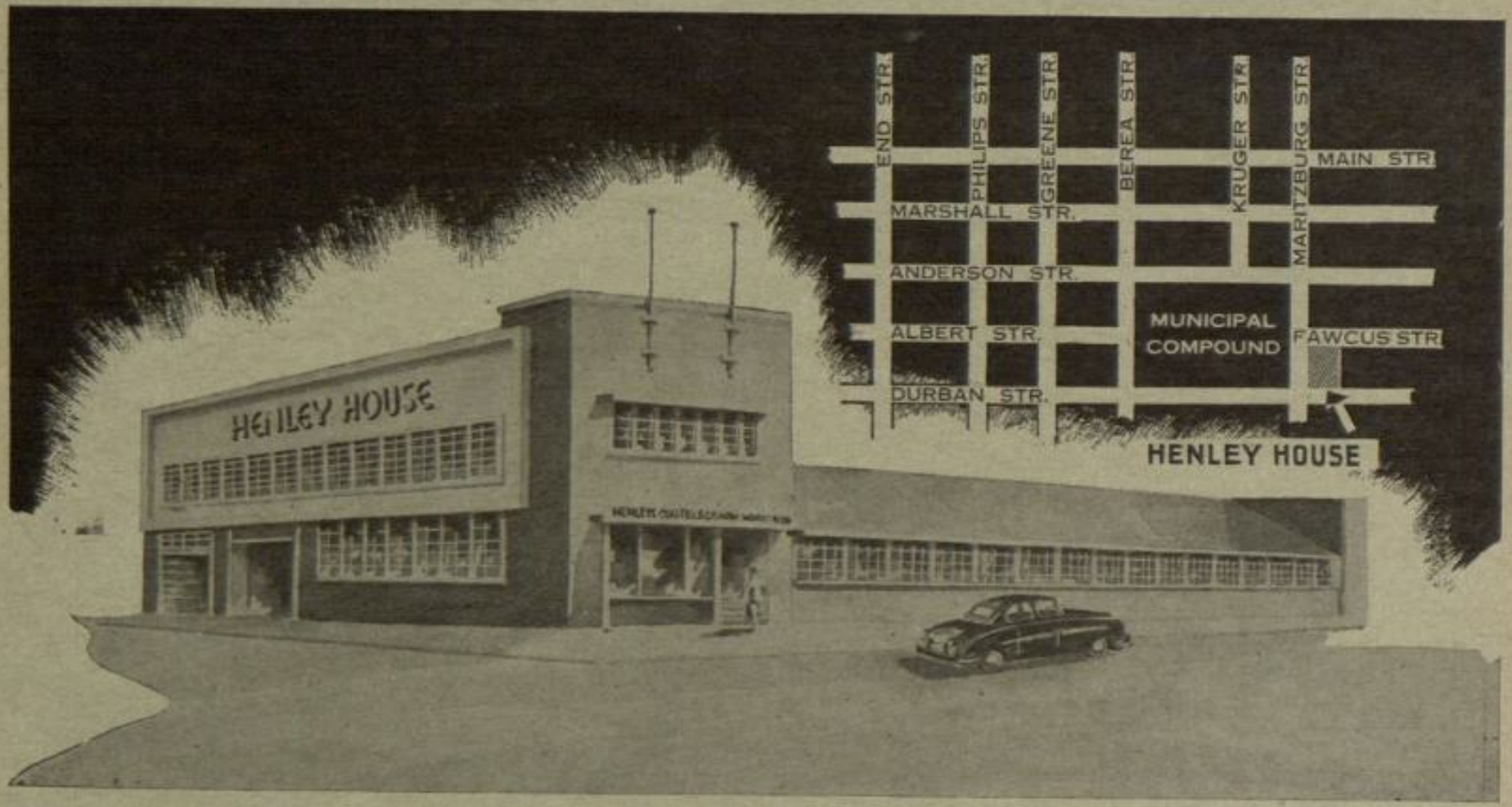

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construction using Robertsons Protected Metal sheeting instead of the more usual type of concrete roof. This has meant that heavy items of plant such as fans and storage tanks have had to be placed elsewhere than on the roofs, thus the induced draught fans are at basement level and the storage tanks placed in the voids between bunkers above the firing aisle.

The boiler house annexe has a concrete roof because of the weight of the F.D. fans which have been placed there to permit simplification of ducting.

The electrical annexe to the turbine house building containing transformers and switchgear is a reinforced concrete framed brick clad building. The reason for this differing construction is the difficulty of foreseeing the type of switchgear and cable hole positions at the time the main building design is prepared which is very early in the planning of the power station design.

The combined control building and office block and the C.W. pumphouse are both reinforced concrete framed 9" brick clad buildings.

The external dimensions of the boiler and turbine houses are such that the larger 15 MW machines may be installed later without serious alteration to the external architectural appearance of the buildings although a variation to the pitching of the bays is to be expected with the larger machines.

When the larger machines are installed later on it may be necessary to arrange the extraction pumps in pits so as to retain the same operating floor level throughout the station.

The weights of steel used together with building volumes for stage I are shown in Table II.

Table II

Weight of Steel and Volume of Buildings

Structural Steel (Tons)	1,620
Volume of Buildings (cu. ft.)	1,624,500 (Excluding Electrical Annexe)

Coal Handling Plant

Table III

Coal Handling Plant

Description	
Transporter	
Rate of Handling (tons/hr.)	100
Drag Scraper Plant	
Rate of Handling (tons/hr.)	80
Belt Conveyors	
Capacity of Main Belts (tons/hr.)	100
Width of Main Belts (ins.)	24
Speed of Main Belts (ft./min.)	220
No. of pulleys/idler set	3
Method of Joining Belts	H.D. Type Fasteners

The coal handling plant for the new Power Station has been so designed as to replace certain sections of the existing plant feeding No. 1 Power Station which is no longer reliable for continuous service.

The rail borne coal is discharged into an undertrack coal boot over the top of which a transporter runs for its full length. The transporter transfers the coal from the boot or direct from the wagons into a movable hopper attached to the transporter. From this hopper the coal is transferred by belt conveyors to a junction tower adjacent to the new boiler house from where it is either fed to store by radial conveyor and drag scraper or fed to the new Power Station by a further belt conveyor. Reclaiming of the coal from store is carried out using the drag scraper and a G.B. conveyor in the junction tower which in turn feeds the further belt conveyor entering the new Power Station.

No. 1A boiler house in the old Power Station is fed by a wing conveyor from the main belt to No. 2 Station delivering coal to a boot outside the station from which the coal is reclaimed by the existing telpher.

No. 1B boiler house in the old station is fed by a conveyor elevator served by the main belt conveyor which feeds the new Power Station.

As mentioned earlier, coal is stored and

reclaimed from the coal store by means of drag scraper plant which makes the maximum possible use of the irregular shaped storage space. The drag scraper equipment incorporates a tail car trolley travelling in track guides on reinforced concrete frames on the outside of which is constructed a coal retaining wall.

Boiler Plant

The boiler plant is of the tri-drum, stoker fired, chain grate type of International Combustion manufacture. Further details of the boiler plant are given in Table IV.

Table IV
Boiler Plant

Description	
Type of Economiser	Plain Tube Senior
Type of Airheater	Plate — USCO
Type of Superheater	Melesco
Furnace Walls	Fin Tube
Volume of Combustion Chamber (cu. ft.)	4,780
Boiler Heating Surfaces (sq. ft.)	
Boiler	8,900
Furnace	1,340
Superheater	5,000
Economiser	6,660
Airheater	14,400
Maximum Air Temperatures (°F)	270
Exit Gas Temperature (°F)	265
Fans per Boiler	
Forced Draught	2
Induced Draught	1
Secondary Air	2
Draught Control	Vane

Ash Handling Plant

A low pressure hydraulic system of ash handling is provided, the ash, dust and riddlings being discharged from the various hoppers into a common sluice way from where the mixture of ash and water is carried into a sump. The mixture of ash and water is then pumped to an overhead ash bunker where the water is drained off to a reservoir which in turn feeds the sluices. The ash is then removed from the bunker by lorry.

High and Low Pressure Pipework

The high pressure steam and feed pipework is of mild steel, the operating temperature being such that non-alloy piping is suitable. For any higher temperatures alloy steel would have been necessary and in fact the bolts used here are of alloy steel and the nuts of ½% molybdenum steel.

The joints on the main steam pipework are Dawson joints which consist of flanges and also a strength weld.

The main steam piping is arranged so that steam receivers are unnecessary. A range is provided throughout the length of the Power Station into which the boiler and turbine piping is taken. Steam separators are provided in each turbine leg and all other branches are suitably trapped so as to avoid the possibility of corrosion fatigue.

The low pressure pipework installed in this station is used for various water and air services. There is an elevated town water tank which receives its supply from the town mains and booster pumps are provided to cater for low mains pressure. The downcomer from the town water tank feeds a further main in the turbine house basement which supplies the feed pump bearings with cooling water and also the treatment plant.

The softened water tank is fed by pumps in the water treatment plant house and the downcomer from this tank supplies the evaporator raw water main.

The general service tank is fed by pumps connected to the circulating water inlet culvert and this water is used for the induced draught and secondary air fan bearings, ash quenching and basement swilling. It is also used as makeup for the ash sump and reservoir.

There are also fire service, compressed air and air extraction systems throughout the station with hydrants and connections at all convenient points.

Town water and clean drain recovery tanks are also provided. The water from the former tank being pumped to the elevated town water tank and that from the latter being returned to the reserve feed water tank.

The R.F.W. tank is situated outside the Power Station buildings at low level and this tank receives the water from the

hotwell overflow which is the way that excess condensate is stored.

Turbo-Alternator Plant

The turbines are of the multi stage impulse single cylinder design running at a speed of 3,000 R.P.M. arranged with steam ends together, for ease of operation. Steam is bled at three points on each machine for feed heating which consists of drain cooler, gland steam condenser, one L.P. heater and two H.P. heaters. The final feed water temperature at maximum load is 293°F and the drains from the heaters cascade to the condenser through the orifice plates.

Each machine is provided with a unit evaporator for providing make-up for the boilers.

The condensers are of the three pass type with 1 in. tubes secured in the tube plates by expanding at the inlet end and by means of Crane packings at the outlet end.

The alternators are rated at 10MWs at a power factor of 0.85 lagging. They each have direct coupled exciters and are ventilated on the closed air system. Stator and rotor temperature indicators are provided and alarm and indicating devices are fitted in the inlet air ducts.

Excitation control is affected by normally inactive, quick acting voltage regulators working in conjunction with motor operated exciter field rheostats.

Further details of this section of the plant are given in Table V.

Condensate System

The condensate and feed heating system is of the closed feed type without the complication of the balance control valve. The water is returned to the boilers from the condensers via the feed heaters. Any deficit of boiler feed water at any instant is made good by balancing down from the elevated hotwell and conversely any excess of water delivered by the extraction pumps will be returned to the hotwell by the same balance pipe.

It is essential of course that the condensate be kept free from oxygen contamination and this is done by ensuring an upward flow in the balance pipe during normal operation. This upward flow into the bottom of the tank displaces the aerated top layers of water through the overflow pipe which returns it to the R.F.W. tanks situated at low level. As a further precaution against aeration if overflow of the hotwells should be difficult to achieve during times of steam surges a floating decanting arm is being installed which will ensure that the surface layers of water in the hotwells are continually removed irrespective of the water level therein.

A diagram of the condensate and feed heating systems is shown in Plate IV.

As mentioned earlier each machine is equipped with a unit evaporator for providing the station make-up and the distillate from these evaporators is admitted to the system at each condenser via the drain cooler. When the evaporators are inoperative or when extra make-up is required this is obtained direct from the R.F.W. tanks by gravity to the make-up tanks associated with the machines.

The hotwells are sufficient in capacity to ensure operation of the machines at full load for at least ten minutes without

Table V

Turbine and Condensing Plant

Description	First Section	1954 Extensions
Type of Blading	Impulse	Impulse
No. and Capacity (MW) of Turbines		
M.C.R.	2—10	1—10
E.R.	8	8
No. of Stages	21 Curtis 18 Rateau	21 Curtis 18 Rateau
Back Pressure with water at 72°F. At economical Rating (in. Hg.)	1.75	1.75
Number of Passes in Water Space	3	3
Cooling Surface sq. ft.	11,500	11,500
Quantity of C.W. (g.p.m.)	8,000	8,000
C.W. Velocity through tubes (ft./sec.)	5.2	5.2
Condenser Tubes Dia. (in.)	1	1
Tube Material	Arsenical Admiralty Mixture	Arsenical Admiralty Mixture

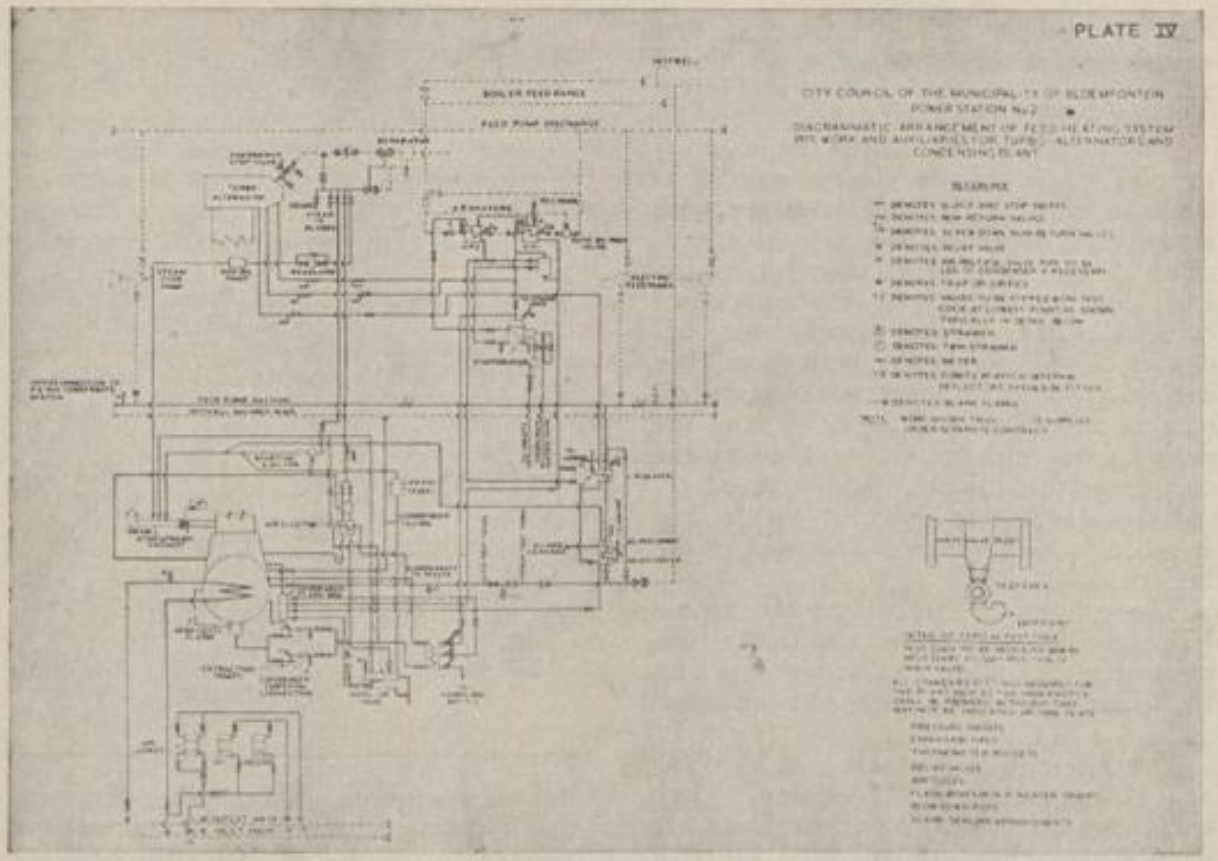


PLATE IV.

any condensate being returned to the system. This is a margin to cope with such contingencies as condenser or boiler tube failures, etc.

One electric motor driven feed pump is provided for each machine together with one spare steam driven feed pump for the first section. The boiler feed pumps are located at operating floor level in the turbine house in order that these most important auxiliaries may be kept under the close supervision of the senior operators. With pumps of this size it is not necessary to provide separate steel supporting structures down to basement level and neither will it be when future pumps of larger capacity for the 15 MW sets are installed.

The pumps are of the constant speed type and are designed to deliver their full rated quantity against boiler design pressure.

All feed pumps are provided with automatic leak-off arrangements actuated by movement of the discharge non-return valves. This is quite suitable for pumps of this size, although temperature control is justified for larger pumps.

Test tanks together with test pipe and pump are provided for steam and heat consumption tests and these are installed in the loading bay of the Power Station turbine house.

Further details of the plant installed in the system are given in Table VI.

Interconnection on both the steam and condensate sides is provided to enable steam from the boilers in the new station to be transferred to the sets in the existing station. A pressure reducing valve is provided in the steam connection for this purpose.

The use of steam from new boilers to serve older machines is a very useful facility, but it introduces some difficulty when the condensate obtained from the old machines has to be transferred from

Table VI

Condensate and Feed Heating Systems

Description	First Section
Final Feed Temperature (°F) at Economic Load	280
Feed Heating Stages	
Low Pressure	1
High Pressure	2
Extraction Pumps per machine and their Capacity (g.p.m.)	Two — 205
Boiler Feed Pumps	
Motor Driven (k.lb./hr.)	Two — 122
Steam Driven (k.lb./hr.)	One — 128
Discharge Pressure (lb./sq.in.)	635
Hotwell Capacity (ft.³)	1,440
Evaporators Capacity at Economic Load (lb./hr.)	6,000

such a station to a new one. In this case a connection is taken from the feed pump suction range in the existing station and a transfer pump is used to return the water to the balance main in the new station.

Water Treatment Plant

The raw water used ultimately for boiler feed is obtained from the town water mains and is stored in the elevated town water tank. From here the water gravitates to a base exchange water treatment plant after which it is returned to the elevated softened water storage tanks and from there passes to the evaporators before finally being introduced into the system.

Base exchange water treatment does ensure zero hardness of the water although the effluent from this type of plant contains dissolved gases which would be undesirable in boiler feed water. However, these gases are removed in the evaporators in this case.

Acidity and alkalinity control is obtained by dosing the condensate system direct. For this purpose a chemical mixing tank is provided in the turbine house, this tank feeding each of the make-up tanks associated with the machines.

A high pressure chemical injection plant is installed for dosing the boiler water with phosphates direct to drum.

Dissolved oxygen recorders are installed at the feed pump suction range for determining the state of the boiler feed water. With constant indication of oxygen content of the water it becomes a relatively simple matter to trace and counteract leaks in the condensate system under vacuum.

Circulating Water System

Considerable modifications were made to the then existing circulating water system at the time No. 6 machine in No. 1 Power Station was installed so as to permit operation on new natural draught cooling towers, two of which have already been constructed.

A diagram of the circulating water system is shown in Plate V.

Previously the No. 1 Power Station relied on two small cylindrical cooling towers and spray ponds for cooling its circulating water and the circulating water pumps used were suitable only for the head imposed by this system. With the installation of hyperbolic natural draught towers adjacent to the main Power Station site the heads were increased considerably and so booster pumps were installed. These booster pumps are situated together in a pump-house adjacent to the turbine house building of No. 1 Power Station although the main C.W. pumps for these machines are in the turbine house basement.

It was decided to site the new cooling towers on high ground relative to the No. 1 Power Station and this meant that the height of the water in the cooling tower ponds was above that in the pump suction chambers in the turbine house. This entailed either very deep excavation for cooling tower ponds which would have been very expensive or the provision of a break pressure tank. This latter scheme was chosen and it consists of two float control valves at the end of the water culvert from the cooling towers. These valves close when the water level in the tank on the outlet or turbine house side rises to a predetermined level just below station basement floor level. To avoid the possibility of overflow in the basement during times of surge, the pump suction chambers were built up a little above basement floor level.

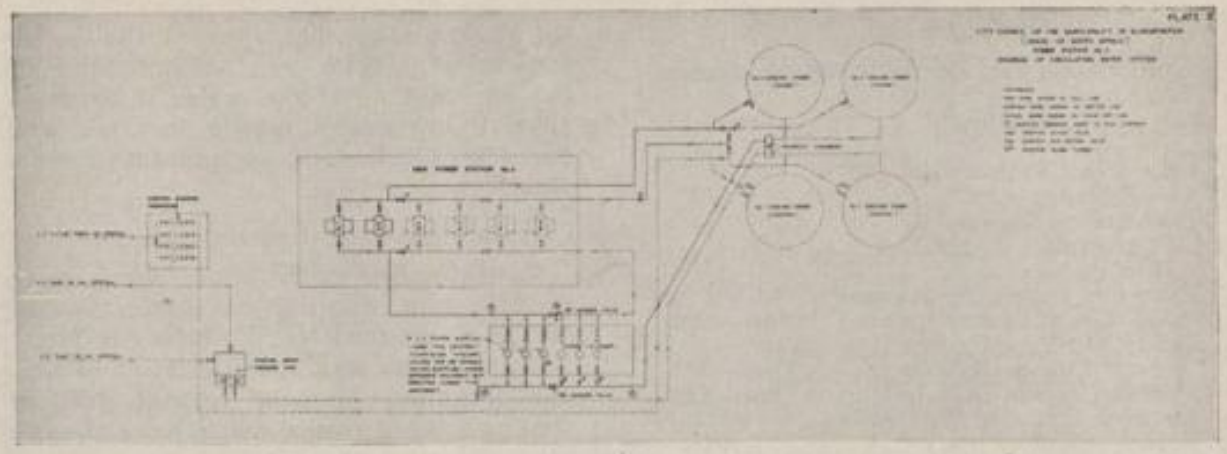


PLATE V.

The machines in the new station are each served by circulating water pumps installed in a separate pumphouse feeding into a common culvert serving all machines. The water is then passed via the condensers to the cooling towers of which there will be four ultimately. Technical details of the plant are given in Table VII.

Negotiations are at present proceeding for the purchase of further land so that a greater spacing between the two future towers may be obtained.

The cooling towers are provided with divided ponds to facilitate maintenance in the early stages although it is not intended to include this feature in the further towers. The fill in each tower is of the splash bar type made from Californian Redwood, one of the durable species of timber. The water is distributed radially over the stack by means of asbestos cement pipes and cast iron involute sprayers.

The make-up water for the system is at present obtained from the town mains, but provision has been made for using sewage effluent when this is made available later.

Main Switchgear

The high voltage switchgear in No. 2 Power Station is 11 kV metalclad indoor type with condensor bushing busbars. The double busbar arrangement provides selection by transferring the circuit breaker itself from one set of busbars to the other. The circuit breakers are oil immersed, solenoid operated and have a breaking capacity of 500 MVA. Bus zone protection will be provided.

For the first stage of the new Power Station two switchrooms are to be constructed and these will be situated on the Ground Floor of the Administrative Block building adjacent to Zulu Street. Sufficient Switchgear is at present on order to provide not only for the con-

Table VII
Circulating Water Plant

Description	First Stage	Second Stage
Type of C.W. Pumps	Vertical Spindle	—
No. of Pumps	3	—
Rating of Pumps (g.p.m.)	8,750	—
Pump Materials:		
Casings	Cast Iron	—
Impellers	Stainless Steel	—
Type of Cooling Towers	Natural Draught	Natural Draught
No. of Towers	2	1
Capacity of Towers (Gall./hr.)	1.25 x 10^8	1.4 x 10^8
Height of Towers (ft.)	200	Not known

nection of the two 10 MW machines for No. 2 Power Station, but also for the connection of the three existing 7.5 MW sets in No. 1 Power Station to the new 11 kV 500 MVA switchboard.

Apart from the three 3 MW machines also in No. 1 Power Station the control of which will remain there, the control room of No. 2 Power Station will become the main system control centre for the despatch of load amounting ultimately to a total of 97.5 MW.

To deal with this load a third 11 kV 500 MVA switchboard will be established at a later date and this together with three busbar reactors will be accommodated in the space between the end of the Administrative Block and the C.W. Pump House.

Each of the switchgear chambers will be provided with automatic CO_2 fire fighting equipment.

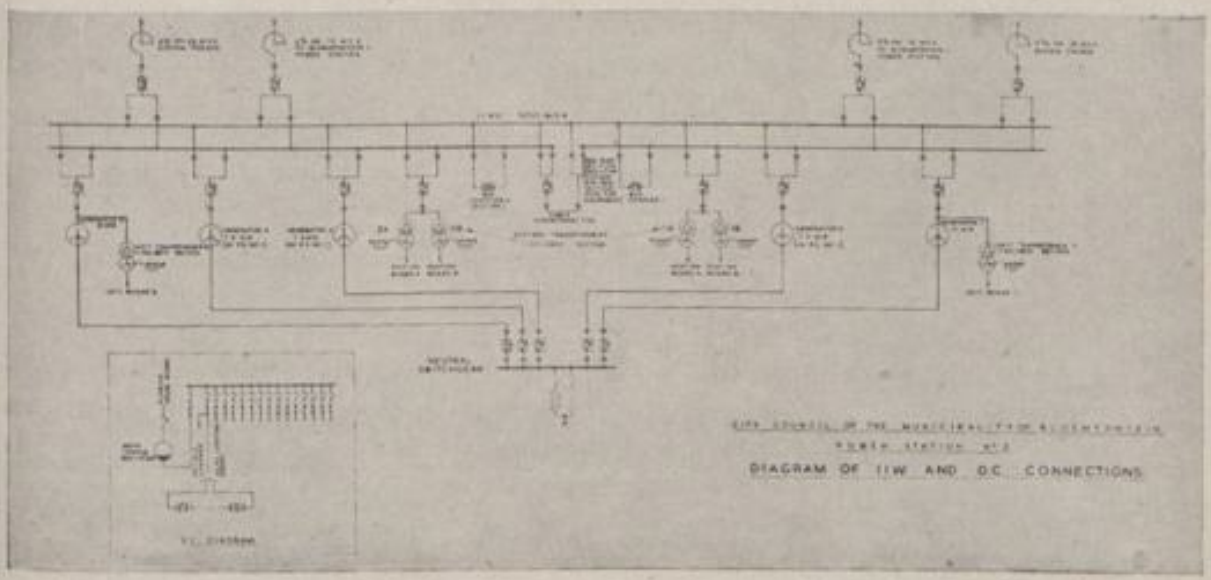
The station auxiliaries are fed from unit transformers with the station transformers fed from the 11 kV 500 MVA switchboard. An interesting feature of this Station is that with 10 MW and 15 MW sets it is possible to omit an intermediate voltage for the Station and unit auxiliaries thereby reducing the capital expenditure for the Power Station. However, such an arrangement necessitates the double banking of station transformers to cater for the load of the auxiliaries of the further extension plant and with this arrangement the fault level can satisfactorily be kept within the capacity of standard low voltage switchgear.

Plate VI shows the busbar arrangements for the initial section of No. 2 Power Station and the electrical interconnection with No. 1 Power Station.

The despatch of load for distribution purposes will be achieved by reactor ties coupled directly to the new 11 kV 500 MVA board, from which power will be fed to sub-area boards, the switchgear for which will initially comprise the existing 150 MVA and 250 MVA switchboards: the former is used for generation at the present time in No. 1 Power Station.

The design of the electrical system has been so arranged that after the full development of No. 2 Power Station the main switchgear could be uprated for 750 MVA working. A change of arc control device can be provided to ensure adequate margin in switchgear fault MVA for a further 30 MVA (safe capacity) infeed from an outside source of supply as is contemplated from interconnection of No. 2 Power Station with a future Power Station yet to be planned.

PLATE VI.



With the expansion of No. 2 Power Station, further sub-area boards will be established at points on the distribution system and will be fed direct from the Power Station either through 11 kV 23 MVA reactors or 11/33 kV step-up transformer ties of the same capacity. Such reactors and transformers will be accommodated in the Electrical Annexe, but for space reasons the transformers will in all probability be of the forced oil circulation type with water cooling.

Auxiliary Switchgear

The Station and Unit Board auxiliary switchgear is of the air break type arranged in double tier formation where convenient. It is rated at 25 MVA at 380 volts. The schematic arrangement of the 380 volt circuits is shown in Plate VII.

The remainder of the switchgear is of the combination fused switchgear type with contactor starters with back-up fused protection for the control of supplies to the various motors throughout the Station.

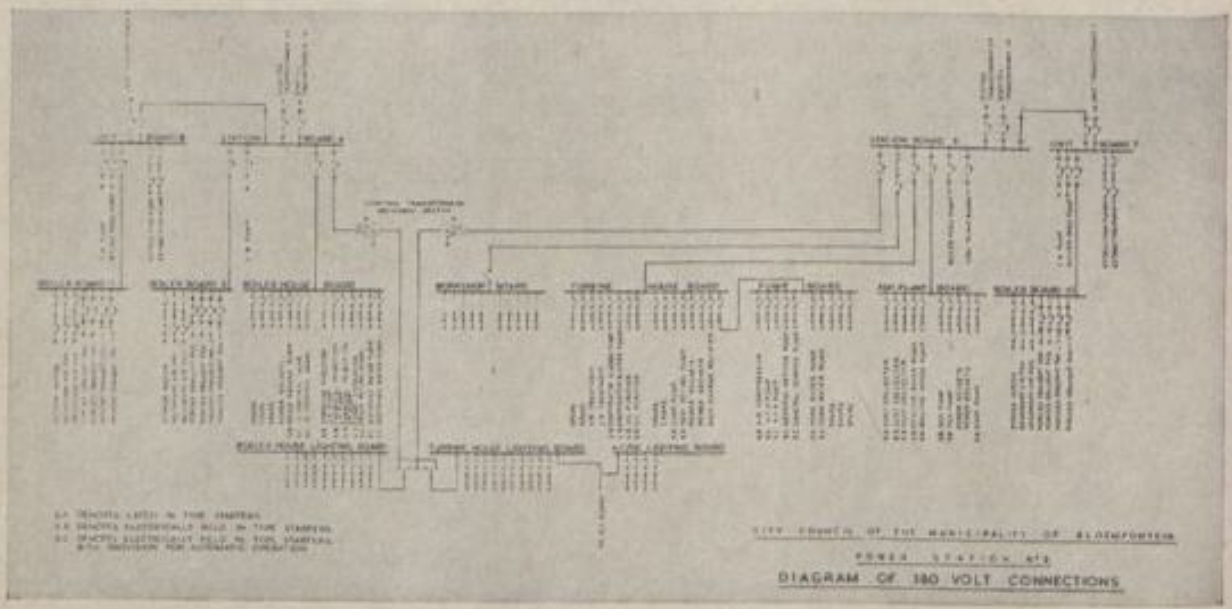
The Unit system has been adopted; the auxiliary voltages and other main data are given in Table VIII.

Table VIII

Electrical Equipment

Alternators	
Rating MW	10
Voltage of Generation kV	11
Speed r.p.m.	3,000
Cooling	Air
Reactance: sub-transient %	12.5
Main and Pilot Exciters: type of drive	Direct
Main Switchgear	
Type	Metalclad
Voltage kV.	11
Rating MVA.	500
Main Auxiliary Switchgear	
Type	Air-break
Voltage kV.	0.380
Rating MVA.	25
L.V. Auxiliary Switchgear	
Type	C.S.F.
Voltage kV.	0.380
Rating MVA.	25
Station Transformers	
Type: Outdoor	ON
Rating KVA.	1,500
Unit Transformers	
Type: Outdoor	ON
Rating KVA.	850
Lighting Transformers	
Type: Outdoor	ON
Rating KVA.	250
Reactors	
Type: Outdoor	ON
Rating: % Reactance and basic MVA.	5% on 10 MVA and 5% on 23 MVA

PLATE VII.



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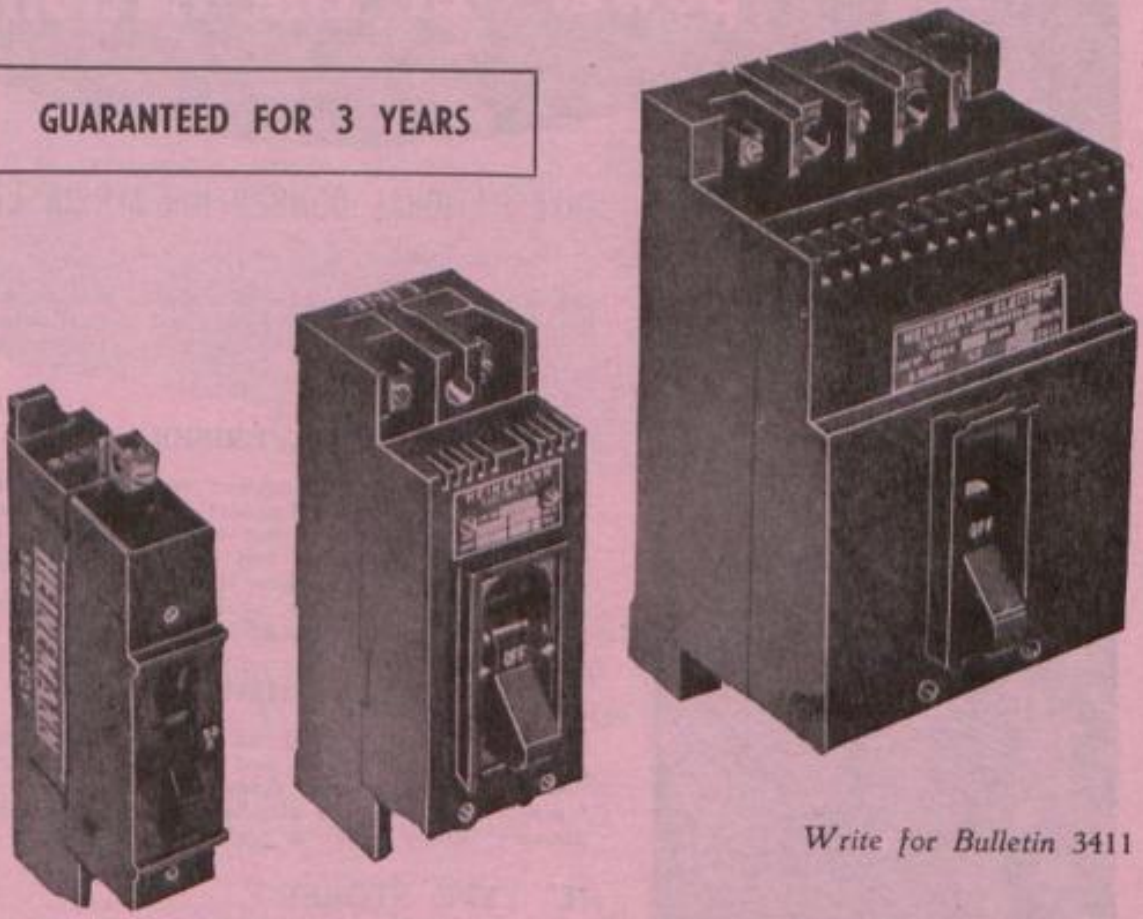

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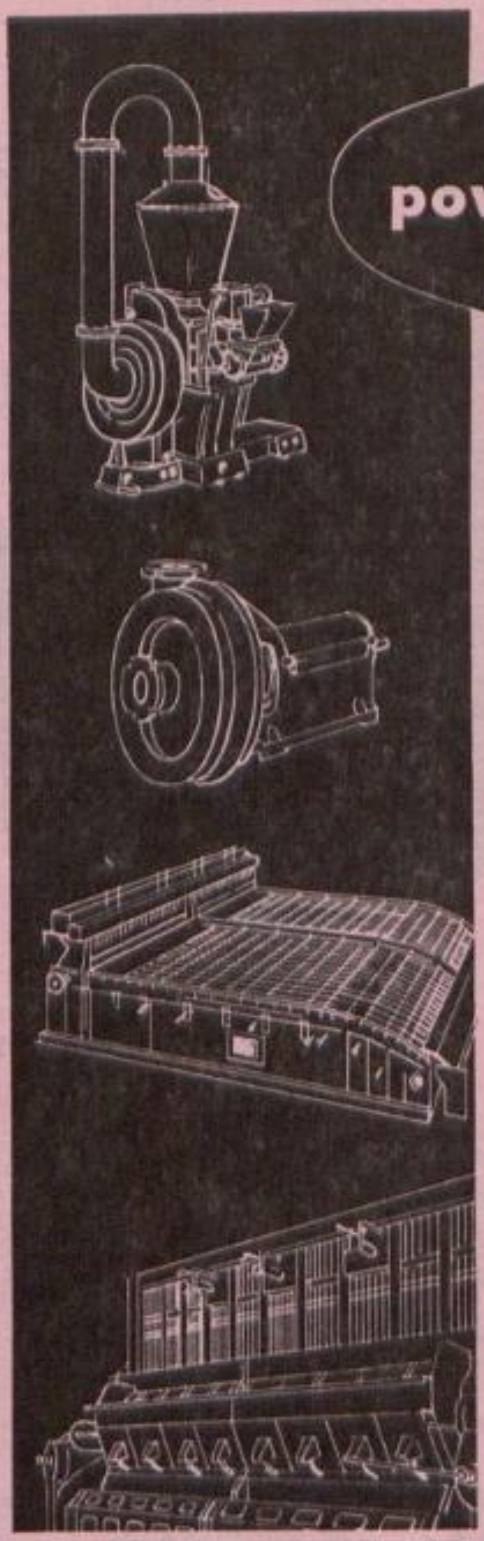

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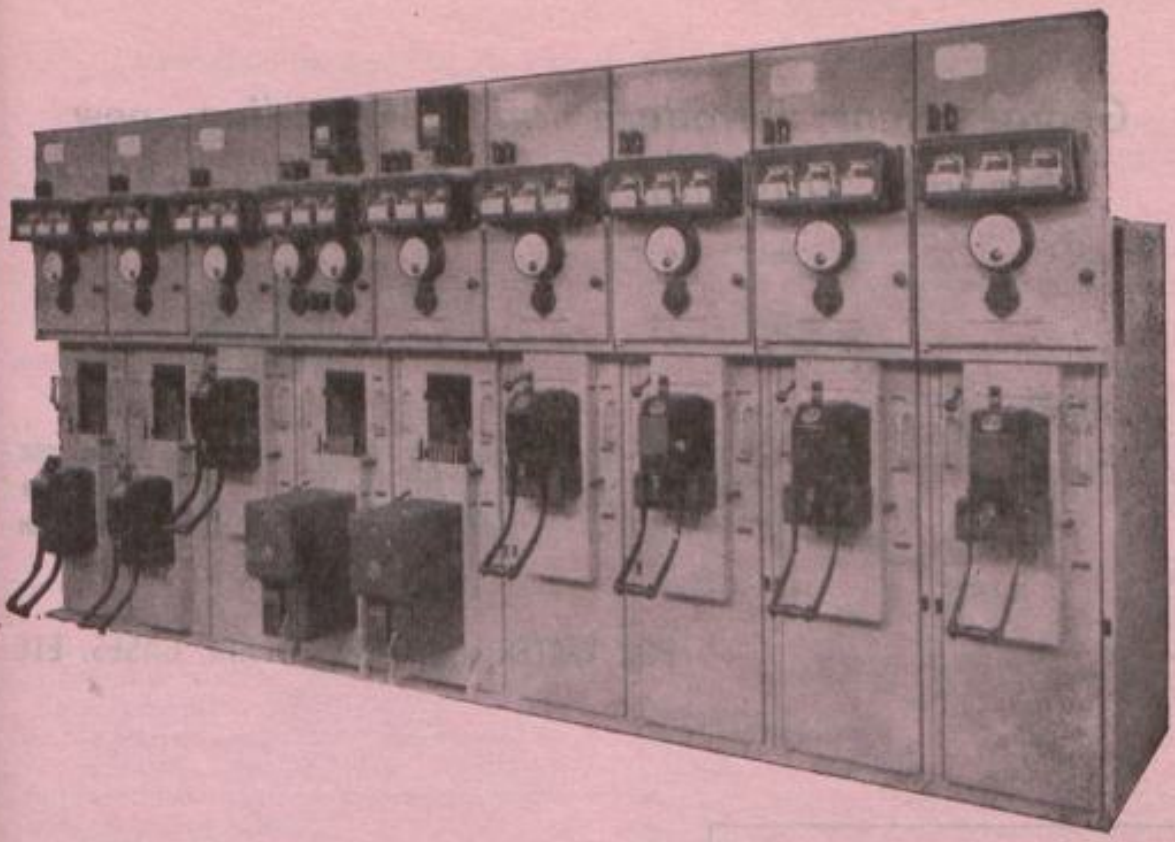

TYPICAL AG16 HIGH TENSION SWITCHBOARD WITH SPRING OPERATED 800 A INCOMING CIRCUIT BREAKERS, AND SEVEN OUTGOING FEEDER PANELS

TYPE AG16 equipment has been designed to satisfy the demand for switchgear which combines high breaking capacity with reliable operation, reduced and easy maintenance, maximum economy in space and speedy erection.

It is of the vertical isolating type, and each switch unit comprises a stationary and a moving portion. The stationary portion houses the busbars, cable boxes, instrument panel, current transformers, and the voltage transformer (when fitted) and the moving portion consists of a wheeled carriage upon which the circuit-breaker is mounted. An integral racking mechanism is fitted to the carriage for raising and lowering the circuit-breaker to and from the service position, and maintenance work on the circuit-breaker is simplified by using this racking mechanism to remove the breaker from its oil tank.

A feature of the gear is the full complement of interlocks which eliminates the risk of incorrect operation.

To facilitate erection on site, each unit is made as a self-contained structure. The use of jigs throughout manufacture ensures that all similar parts of equal rating are interchangeable. All items of equipment are easily accessible from the front, back or top of the unit.

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Breaker	Rating
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	150 MVA at 6.6 k.v.
	150 MVA at 11 k.v.
"Trinal" TSB (Arc-control)	250 MVA at 6.6 k.v.
	250 MVA at 11 k.v.

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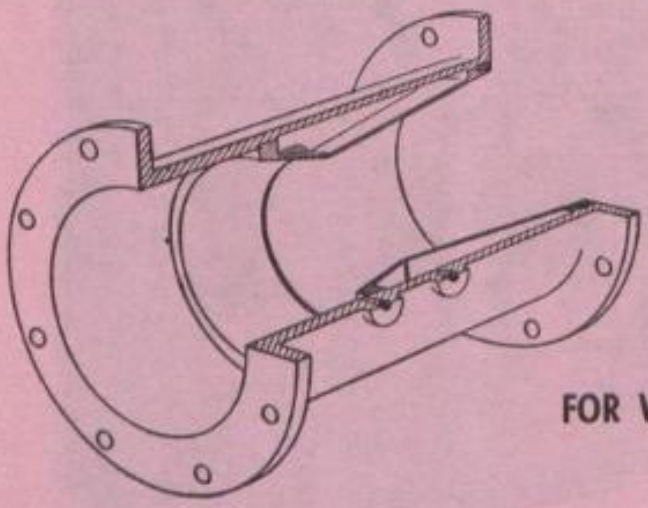

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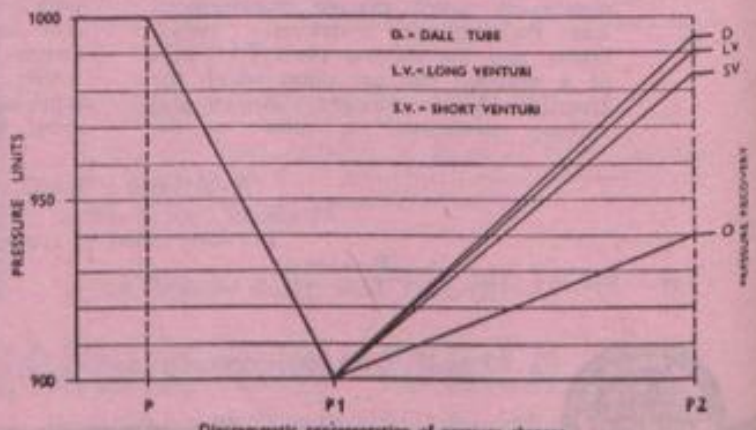

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The auxiliary switchgear is located in chambers in the Electrical Annexe outside the turbine house and at the rear of the boilerhouse, with control panels on the operating floor. The switchgear itself is, where possible, placed at operating floor level to give access for operators.

Operating Room

A discrepancy lamp indication corridor type panel has been adopted in this instance on which the indicators, instruments and control details to operation are mounted on the front panels with other controls situated on the control desk. The busbar zone protection relays and other protective relays are situated on relay panels at the rear. The voltage regulator equipment is mounted on separate panels.

Each generator has a separate panel. For the feeders and similar circuits carrying reduced control and protective equipment two circuits are conveniently mounted in one cubicle.

The instruments, control switches, terminal boards and relays are of normal switchgear construction, and light current telephone type apparatus is used only for alarm annunciator and communication purposes.

The generator control desk contains the generator speed and excitation controls. Switching cannot be carried out at the desk, the circuit breaker control switch and synchronising block being on the control panel.

A portable synchronising trolley will be provided suitable for use with either the high voltage and low voltage switchgear.

Instrument Panels

The turbine gauge boards and boiler control panels have been arranged individually and located conveniently with respect to the associated turbine and boiler plant.

Contractors

A list of main Contractors engaged in the Works for No. 2 Power Station is given in Table IX.

Acknowledgements

I have to thank the City Council of Bloemfontein for permission to publish these details of their undertaking, and the City Electrical Engineer for his invitation to read a paper on our Station No. 2.

Last, but not least, my thanks are due to the Council's Consulting Engineers, Messrs. Merz and McLellan, S.A. for their assistance, without which it would, under present conditions, have been extremely difficult for me to present a paper of this nature.

Table IX

List of Main Contractors

Foundations, Buildings, Chimney and Cooling Towers	—	Lewis Construction Co. (S.A.) Ltd.
Structural Steelwork	—	Alpheus Williams & Dowse Ltd.
Turbine House Crane	—	Woolf Engineering, Ltd.
Boiler Plant	—	International Combustion Africa Ltd.
Coal Handling Plant	—	Mitchell Engineering Group of S.A. (Pty.), Ltd.
Ash and Dust Handling Plant	—	International Combustion Africa Ltd.
High and Low Pressure Pipework	—	Stewarts & Lloyds of S.A. Ltd.
Turbo-Alternators and Condensing Plant	—	British General Electric Co. (Pty.), Ltd.
Circulating Water Pumps	—	Steelmetals Ltd.
11 kV Switchgear and Accessories	—	British General Electric Co. (Pty.), Ltd.
380 Volt Switchgear and Accessories (Station and Unit Boards)	—	The English Electric Co. of S.A. Ltd.
380 Volt Switchgear and Accessories	—	Siemens (S.A.) Ltd.
Station and Unit Transformers	—	National Engineering (Bonar-Long)
Lighting and Heating Transformers	—	Reimen El-Mec.
Cabling	—	African Transmission Construction Co. (Pty.) Ltd.

PRESIDENT: I will now ask Mr. Sibson to propose a vote of thanks to Mr. Hafele.

OPENING OF DISCUSSION ON PAPER BY C. F. HAFELE:

Mr. A. R. SIBSON (Bulawayo): Mr. President and Gentlemen, I would like on behalf of yourself, and the members present, to congratulate Mr. Hafele on the paper he has just read to us.

I am particularly interested, and somewhat surprised, to note that the Author refers almost apologetically to the switchgear being contained in a reinforced concrete framed, brick clad building, unlike the rest of the buildings which are of structural steel. The question will be dealt with more fully by the seconder of this motion, but I would like to mention that I have found that reinforced concrete buildings cost anything from 30% to 40% less than those employing structural steel. I should therefore have expected the Author rather to have explained why reinforced concrete has not been used to a far greater extent.

It is noted that air-heaters of the plate type are being employed, and it would be interesting to have the Author's comments on the suitability of this kind of equipment with the sort of coals that are likely to be burnt in Bloemfontein, with particular reference to the comparatively low exit gas temperature of 265°F. In Rhodesia, plate type heaters have been found to be most unsatisfactory.

The Author mentions the fact that "non-alloy" type of steam piping is adequate where steam temperatures such as those for which the station is designed are used. This is true provided the designed temperatures are, in fact, adhered to. Perhaps the Author could indicate what methods of controlling steam temperatures are employed.

There is no reference in the paper to circulating water treatment. It would be useful to know what is proposed in this connection. In Bulawayo the use of automatic base-exchange softeners has eliminated all need for condenser cleaning, and I think that some eight years have now gone by since tube cleaning was indulged in. Account must, however, be taken of the effect of soft water on the timber stacks of cooling towers, and it may be necessary to strike a delicate balance between the two opposing factors.

There is a matter of some importance to which no reference was made in Mr. Hafele's paper and that is the capital costs of the scheme. A separate descriptive leaflet that has been circulated with the Conference papers suggests that this cost, for the first portion of the scheme, will be of the order of £104 per kW installed. I am very concerned about the rising costs of generating plant. Before the war we had, as the extreme limits of cost, Klip at about £17 per kW and Orlando at about £29 per kW. If an average of, say, £25 were assumed, it is difficult to understand why the present-day costs should be as much as four times this figure. I don't think the manufacturing costs of thermal, mechanical and electrical plant have advanced as much as this.

As a matter of interest I should like to quote the figures applicable to the 13th Avenue Power Station in Bulawayo. The first portion, of 15 MW capacity, was ordered in 1944 and commissioned in 1948 at a cost of £41.2 per kW. The second portion, of similar dimensions, commissioned in 1951, cost £41.7 per kW, rising costs being offset by the fact that certain fixed plant was not duplicated after the first installation. The third installation, of 30 MW capacity, was commissioned in 1953 and cost £54 per kW including, as it did, for buildings for two 30 MW sets together with mechanical coal and ash handling plant. The following 30 MW extension, due for commissioning in 1955, is estimated to cost £50.7 per kW, while the final extension, for which orders have been placed and which is due for commissioning in 1957, is estimated to cost £47.5 per kW, there being no cooling towers in this last extension.

The overall cost of this 120 MW station, complete in all respects but not including the value of the land, therefore amounts to £48.4 per kW. This is for a station whose initial plant was commissioned in 1948 and which will be complete in 1957. At least half of the capacity

is, however, still to be commissioned at the present date.

In conclusion, I would once again congratulate Mr. Hafele on this excellent paper, and I have huch pleasure in proposing a hearty vote of thanks to him on your behalf for this contribution to our Proceedings.

Mr. J. E. MITCHELL (Salisbury): Mr. President, Gentlemen: I would like to compliment Mr. Hafele on the paper he has prepared for this convention, describing in great detail the design and design features of the new thermal power station which is being built in this City, and also for the wealth of description given in the tables and drawings, although some of the drawings, especially in regard to switch arrangements, are a little too small to be read without the magnifying glass.

I have one or two comments to make in regard to the various aspects of the design of this power station, and firstly I would like to comment on the size of machine it is proposed to install.

I fully realize that an estimate of the rate of growth has been made and it is presumed, taking into consideration the economics of the case and the amount of night load anticipated, the sizes of 10 MW and 15 MW machines, and 110 and 130 k.lb./hour boilers have been decided on those factors.

In my experience, however, these are not the only factors which decide the size of machine, especially in these relatively small sizes. Two other factors are quite important. The first is that the majority of designs below 20 KW, in order to obtain high efficiencies, are very much more delicate these days than heretofore, and unless they are very carefully handled can be very troublesome. The second aspect is in regard to maintenance, for again it is found that it is the number of machines and boilers which increase the maintetenance cost per kilowatt rather than the size mainly, of course, because the maintenance costs are about 75% labour, and the cost of overhauling, say, a 150 k.lb./hour boiler or a 20 MW machine in labour is very little different from the cost of overhauling a machine and a boiler half the size.

I would suggest to the Author, therefore, that in view of my first reason, that of robustness, coupled with the difficulty of getting first-class operating staff, and my second reason, that of maintenance costs, that before deciding on 15 MW machines, he should examine the position very carefully to see whether the additional loan charges on a 20 MW machine, instead of a 15 MW machine, for two years or less, according to his rate of growth, would not be offset by the lower cost per kilowatt of the larger machine and boiler, and the more trouble-free running and cheaper maintenance features.

If the Author does finally decide on 15 MW machines, I would most seriously suggest to him that with the load factor of Bloemfontein about 40% and, I presume, a fairly small night load, he should definitely fit barring gear to the 15 MW machines, and give very serious consideration to fitting it to the 10 MW machines as well.

My next comment is in regard to the civil works. My colleague, Mr. Sibson, left me this subject to speak on because he found himself in complete accord with my own views. The Author appears to apologize for the use of reinforced concrete in the switch house, his reason for using that type of construction in that position being the inability to forsee the type of switchgear and the cable holes that will be required in the future, and that is a very sound reason. Personally, however ,I feel there is no need for apologizing on that score, but I am afraid I am going to be critical of the use of a steel frame structure for the power station itself.

The cost of No. 2 power station Salisbury civil works, which is now almost complete, and is of exactly the same size as that proposed for Bloemfontein, namely 75 MW, and excluding the cooling towers, is in the region of £4 10. 0. per kilowatt, and the majority of this building was erected during high cost periods and on relatively poor foundations. It should also be realized that I have information showing that building costs in Rhodesia are 15% higher than in the Union. Bulawayo power station was built at an even lower

cost, I think somewhere between £3 10. 0. and £4, and I understand that the cost of Pretoria was in the region of the cost of Salisbury, consequently, by using reinforced concrete, the cost of building power stations is about 40% to 45% lower than the cost of steel frame structures.

In table 2, the amount of structural steel for the first stage is given as 1,620 tons which, in itself alone, works out at over £8 per kilowatt.

On page 9, the Author states, in describing the condensate system, that as a further precaution against aeration, if overflow of the hotwells should be difficult to achieve during times of steam surges, a floating decanting arm is being installed which will ensure that the surface layers of water in the hotwells are continually removed, irrespective of the water levels therein. I should like greater detail and description of this feature as it does seem to me that when there is a steam surge then this decanting arm suggested, will be dangerous, in that it will tend to empty the tank just at the time when it would be most undesirable to do so.

On page 10 in regard to water treatment plant, the Author states that acidity and alkalinity control is obtained by dosing the condensate system direct. This is quite new to me: in most power stations to my knowledge, the second feature described by the Author, namely a chemical injection of the boiler water, being the more usual, and I have a feeling that unless such a method is very adequately controlled, he may get a concentration in the boiler which is just what he is trying to avoid. I do feel, therefore, that some explanation is due from the Author as to why this additional feature is necessary at Bloemfontein, and what chemicals it is proposed to use.

Mr. Sibson actually mentions water treatment in respect of cooling water, and mentions the fact that Bulawayo, due to its method of softening never at any time have to clean the condensers, but I feel I must give you a word of warning here because very soft water can leech the Californian redwood in your cooling tower, causing a certain amount of trouble. We have not had this experience in Salisbury, and feel this is due to running the station on circulating water with a hardness of as high as twelve without having any trouble with condenser cleaning nor of leeching of the timber.

Under the same heading the Author states that dissolved oxygen recorders are installed at the feed pump suction range for determining the state of the boiler feed water, and that with constant indication of oxygen content of the water it becomes a relatively simple matter to trace and counteract leaks in the condensate system under vacuum. From my experience, Mr. President, this is a case of most exceptional wishful thinking for, in the first instance, I have yet to see a dissolved oxygen recorder which works properly and secondly, having found that there is an oxygen leak, this is one of the most difficult features to trace in any power station, and is not a relatively simple matter.

With regard to the circulating water system, I see that there is a separate pump house for power station No. 2, and I should like to know what the reason for this is, as it seems to me a very expensive method. The pumps, for the size of machines installed in this power station, are quite small enough to be placed in the turbine basement, thereby saving an extra building and additional pipework. It has also been my experience that a separate pump house, unless definitely required because it is a riverside power station or a very large power station, is often wasteful of auxiliary power, in that the pump house attendant often runs considerably more pump capacity than is necessary.

I have found it a little difficult to comment on the arrangement of switchgear as the plates in the paper are rather indistinct, but from the description it seems that this is the usual layout for a power station of this size.

It might, however, be helpful to give the Author the benefit of the experience at Salisbury of a layout of a very similar nature, where the load, as at Bloemfontein, was picked up on subboards fed through reactors from the main board, especially where the subboards have no duplicate busbars.

The position at Salisbury was slightly

different, in that a considerable amount of load was to be picked up from a switchboard at the old power station and, with the design as originally laid out, it meant that a quarter of the City was supplied from each one of four subboards. Due to the fact, however, that it was decided not to use duplicate busbars for the subboards, the final arrangement of the system was such that a ring feed from one subboard did not come back to the same subboard, but to one which was directly connected to it and fed from the same reactor. Without this feature, a busbar fault on a subboard means the complete shut-down of a quarter of the city.

Mr. Sibson actually gave you some figures in regard to the costs of power stations, and I feel that possibly the figures at Salisbury might also be interesting.

In the Salisbury 75 MW power station, comprising

Two 7.5 MW machines installed in 1946
Two 10 MW machines installed in 1953, and
Two 20 MW machines installed this year

so that a considerable amount of the last 60 MW has been purchased recently, the price has come out almost the same as Bulawayo, namely £48 per kilowatt.

The No. 3 power station which is now being constructed, which comprises, in stages I and II

Two 30 mw. machines, and
Three 210,000 lb./hour pulverized fuel boilers with electrostatic precipitators but in an outdoor boiler house

all of which contracts have been let, is coming out at £63 per kilowatt, and this includes for all coal handling for the final designed 180 MW station, along with the final size control, switch houses, etc.

I would like, Mr. President, to thank the Author for presenting this instructive paper to this gathering, for I am sure we have all found it most interesting, and we shall all have benefited by listening to the Author. As we in Salisbury had had experience of building an almost similar power station, I felt I had good reason to contribute to this discussion. I have very great pleasure, therefore, in seconding the vote of thanks so ably proposed by Mr. Sibson.

PRESIDENT: Thank you very much Mr. Mitchell for seconding the vote of thanks. Gentlemen you have heard the proposer and seconder, have I now your approval of the vote of thanks for this paper of Mr. Hafele? APPLAUSE.

If there are any further discussions, you are very welcome to do so. As our time is very valuable gentlemen, I suggest that further discussion on this paper, be contributed in writing for inclusion in the Proceedings.

Mr. H. J. GRIPPER (Port Elizabeth): Mr. President and Gentlemen: I should like to add my thanks to Mr. Hafele for his paper which is of topical and technical interest at the present time.

It might be of interest if Mr. Hafele would enlarge upon the following points which I put to him in the form of questions.

1. Are the elevated coal bunkers for the new boilers to be concrete lined?
2. How is the rail borne coal discharged from the trucks in which it is received?
3. What is the storage capacity of the coal yard?
4. What is the depth of the coal storage and how would any possible spontaneous combustion be dealt with if it should occur?
5. In view of the value of Power Station ash to-day, both for Municipal and Business purposes, is there any difficulty in disposing of the ash in Bloemfontein?
6. Is there any particular reason why the makers provide alarm and indicating devices in the alternator air circuit on the inlet rather than on the outlet ducts?
7. It is noted that the switchgear for various motor circuits throughout the Power Station includes contactor starters. Are these of the normal holding type or of the latching type? If the former it is probable that machines may be lost on low voltage surges just when they are most needed.

No mention is made in the paper of the present or future system load factor. It is possible that the operation of Municipal pumping plant has some bearing on this

and any information on this point would be interesting. The Bloemfontein City Council is apparently faced with a shortage of power at the present moment which, notwithstanding the author's remarks concerning the unexpected demand from the Railway Administration, would indicate that the decision to increase the Power Station capacity was taken rather late. It would be interesting to know whether the City Council had previously embarked upon a power sales campaign either within or without the City boundaries or whether the present situation has merely arisen from unsolicited expansion. Nevertheless it is pleasing to note that provision is now being made for interconnection of this Number Two Power Station with a future Power Station. In this matter and in many of the technical features described in the paper, the Bloemfontein City Council is to be congratulated upon its foresight in which I suspect the City Electrical Engineer, his staff and the Consulting Engineers have had a hand.

Mr. J. C. FRASER (Johannesburg): It is interesting to note that the City of Bloemfontein has an electrical load increasing at 12% per annum. When the Orlando Power Station 1949/55 Extensions were under consideration, the rate of increase of maximum demand for Johannesburg was based on 15% per annum, but was subsequently reduced to 11% as the estimated peaks were not reached. This latter figure has been justified by the loads actually met in recent years. A rate of increase of 12% is equivalent, incidentally, to a doubling of output every 6.1 years.

A point which is not made in the paper is the proposed increase in capacity of the second four boilers from 110,000 lb./hour to 130,000 lb./hour to balance the increase in the turbo-alternator capacity by the change from four 10 megawatt to three 15 megawatt sets. The final boiler capacity would appear to be approximately equivalent to 87 megawatts to supply 75 megawatts total machine rating — a surplus of 16 per cent. For the first half of Orlando Power Station a boiler capacity equivalent to 175 megawatts has been found ample for 150 megawatts (M.C.R.) of machine capacity; the surplus being thus 16.7%. At Orlando, however, the first five machines have a one hour overload rating of 37.5 megawatts, which is 25% more than the M.C.R. rating.

The author states that the amount of steel in building has ben reduced to the minimum. Has this been done purely to keep down the building and foundation costs or are other factors operative, for example the general steel shortage of a few years back? As this section of power station construction costs is one on which many engineers feel some economies can be effected, it would be interesting to have more details of the steps taken towards achieving economy in steelwork, and also of the special roof construction adopted. Some comparative data regarding the Orlando and Bloemfontein Power Stations steel framed buildings are as follows :-

	Orlando	Bloemfontein
Floor area sq. ft.	161,300	not stated
Cubic Capacity (excluding electrical annexe) cub. ft.	13,950,000	1,624,500
Weight of structural steelwork (tons)	12,000	1,620
Weight of steelwork per 100 cub. ft. of building capacity — tons	0.86	0.99

Coal Plant.

The combined power station, of 97.5 megawatts installed capacity, can be expected to burn approximately 900 tons of coal per day during winter months, but Bloemfontein will be fortunate if its receipts of coal on any one day do not exceed three times this amount at times. The use of the transporter to unload coal from the railway wagons is novel, and its use will undoubtedly be attended with its own problems, particularly since the capacity is limited to 100 tons per hour. Presumably a small labour force will be available to assist in lashing the coal and unloading when receipts are exceptionally high or in event of breakdown of the transporter.

Pipework.

The size of boilers and turbines tends

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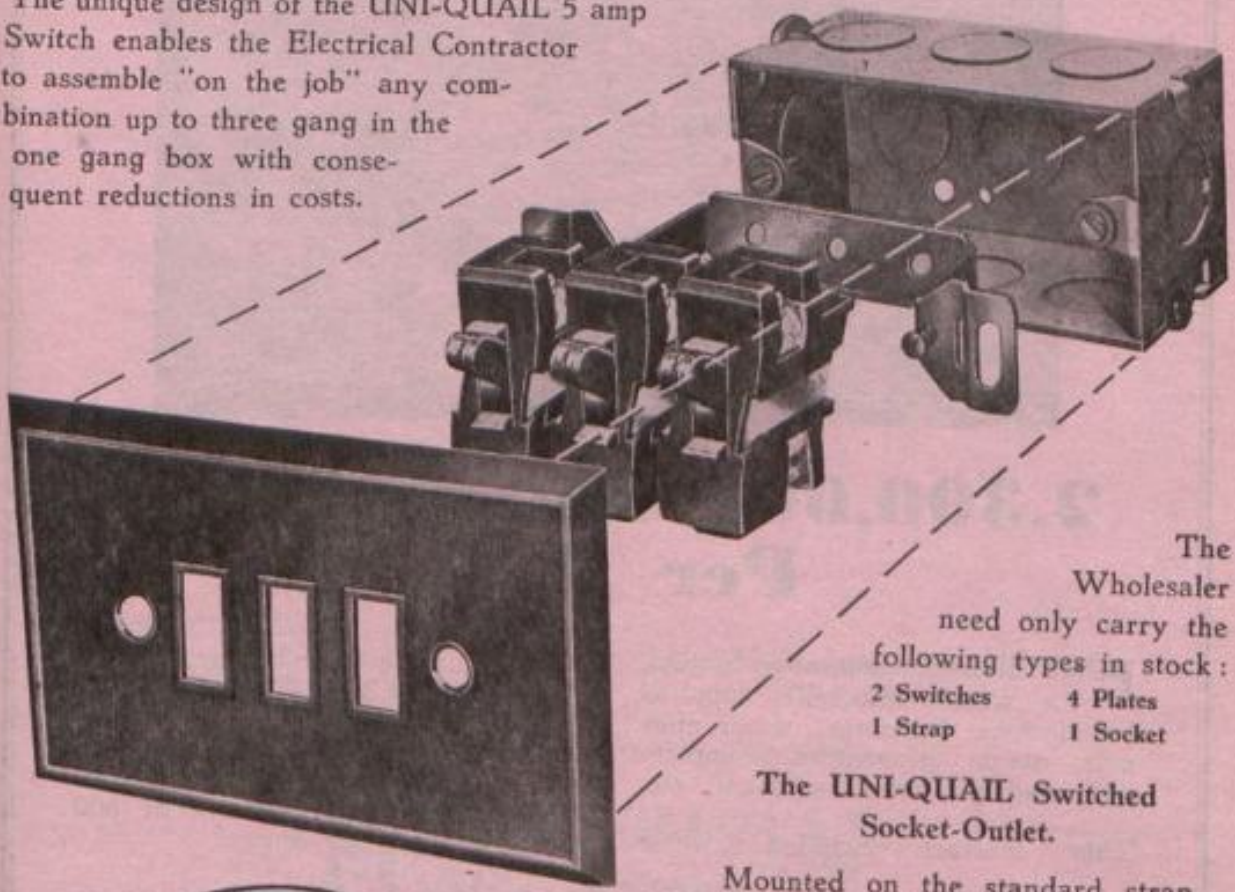

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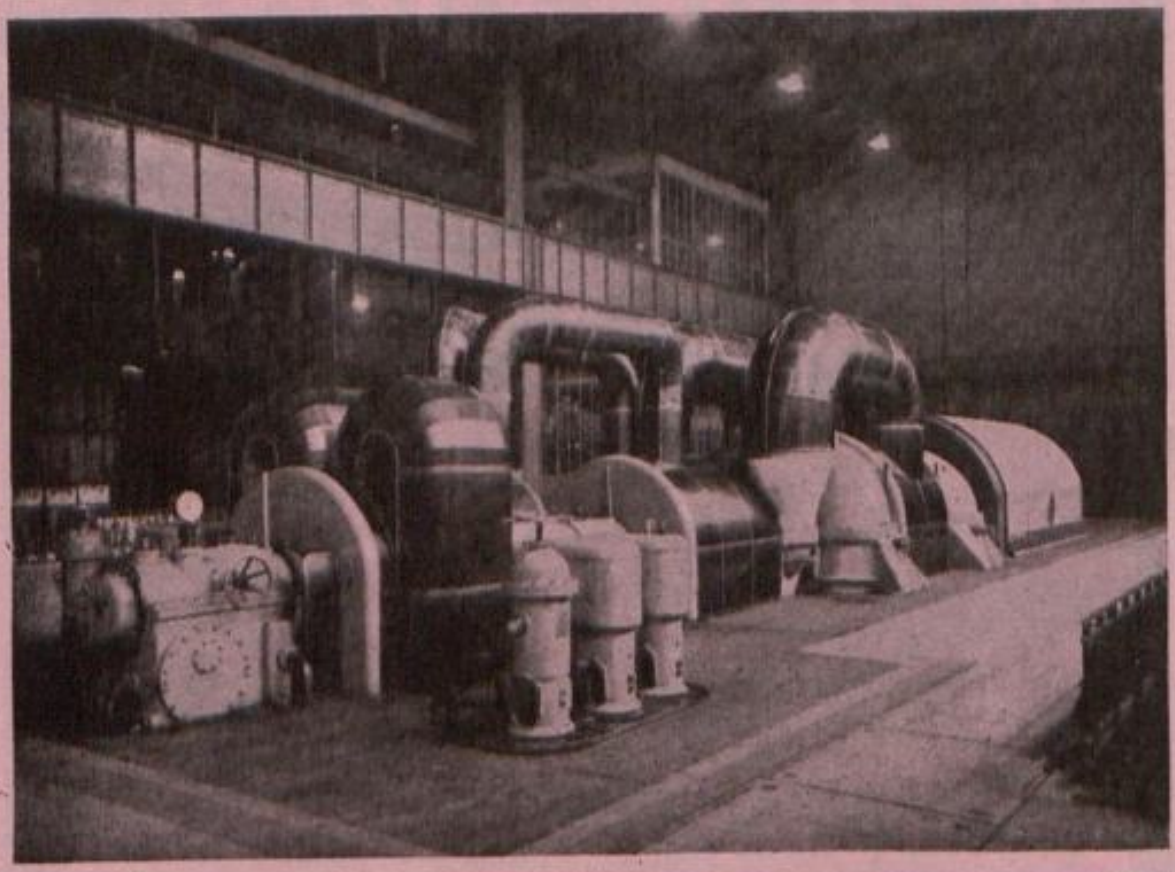

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to make steam receivers unnecessary, but it does not follow that the possibility of corrosion fatigue in the steam main is eliminated. Have any facilities been provided for its internal examination, particularly in the vicinity of the entry of steam pipes from the boilers?

Switchgear.

The situation of the main station switchgear on the ground floor of the administrative block and main system control centre seems to be contrary to modern practice, as in the event of a switchgear explosion — a by no means unlikely possibility — the "nerve centre" of the whole system may be put out of action. Past experience in Johannesburg has led us to prefer segregation of switchgear and control facilities.

MR. HAFELE'S REPLIES TO DISCUSSIONS ON HIS PAPER

The author is gratified at the response which the subject of this Paper has drawn and feels that the contributions by way of the comments, coming as they do, from Engineers in charge of Power Stations in which the best modern practice is represented, should be of much interest to all associated with power station work.

For the sake of simplicity and ease of reference it is proposed to reply to the comments raised by the various contributors under the headings which follow.

DESIGN CONSIDERATIONS

The load factor used for estimating purposes at the time the station design conditions were decided upon was 42 per cent and the night load was 20 per cent of the day load.

In reply to Mr. Mitchell's comments on the size of machines chosen I cannot agree that those of 10 MW and 15 MW capacity are necessarily less robust than those of 20 MW capacity.

An increase in the capacity of the sets to 20 MW would necessitate the Undertaking having to carry additional standby capacity which is particularly uneconomical with the present high cost of new plant. The amount of plant which can be installed on this site is also limited by the space available and the larger sets therefore reduce the effective or safe economical capacity of the site, thereby increasing the high initial capital expenditure required to develop a new station.

The low night load referred to earlier is also a point in favour of the smaller sets.

I agree that the maintenance cost of boiler plant per lb. of steam is reduced as the size of boiler increases but this must be balanced against the number of boilers required to ensure that the maintenance and overhaul programme can be arranged throughout the year without affecting the safe capacity of the station to meet the seasonal loads. Larger boilers, as in the case of larger sets, also increase the outage factor and hence the capacity and cost of the steam generating plant which must be installed. With the increasing use of electricity and the vital part it plays in maintaining the essential needs of a modern community the continuity of supply becomes of increasing importance and with an isolated generating station the security of supply is inevitably jeopardized if a sufficient number of boilers is not provided so that an adequate maintenance programme can be carried out.

The boiler size of 130,000 lb/hour for the extensions is the largest capacity possible incorporating a single grate. Any increase in capacity would therefore have necessitated twin grates with the resultant additional maintenance and possibility of breakdown.

Mr. Fraser's comments on boiler capacity are of interest, but it should be borne in mind that at Bloemfontein a steam connection is being provided serving No. 1 power station which will put to good use spare boiler capacity in the new station up to a maximum of 90,000 lb/hour. It is likely that the turbines in the existing power station will outlive the boilers by some years and the transfer of steam will continue for many years to come.

PLANT LAYOUT

Mr. Mitchell asks why a separate C.W. pumphouse is provided instead of placing pumps in the turbine house basement. The size of the buildings of this station have been reduced to the minimum consistent with efficient operation and there were no

vacant areas suitable for accommodating unit C.W. pumps together with their associated valves, etc. Any increase in the floor area of the turbine house would have involved increasing the size of the whole building which is 60 ft. high compared with the height of 20 ft. for the separate pump house. The separate pump house also permits the parallel operation of all the C.W. pumps which feed into a common bus main, which is useful for reducing the number of pumps in operation thereby economizing in pump operating costs.

Mr. Fraser questions the advisability of siting the control room above the switchhouse. With the use of fully tested modern switchgear and methods of protection, including busbar protection, the danger resulting from explosion has been reduced to negligible proportions. While a separate switchhouse is adopted where space permits there are a number of modern stations in this country and abroad where the switchhouse is incorporated in the control block building. Due to the restricted site at Bloemfontein this arrangement had to be adopted.

POWER STATION BUILDINGS

Mr. Fraser has referred to the economies which can be effected in the design of the steel frame. As is generally known, no great reduction in building steel can be achieved without a completely new approach to such items as high level coal bunkers and the turbine house crane. However, certain economies have been achieved in this instance by locating all water storage tanks and hot wells in the voids between the coal bunkers instead of on the roofs. It will also be noted that no separate feed pump bay is provided, these pumps instead being served by the main turbine house crane. Wherever possible, the main power stations roofs are of protected metal sheeting. The supporting steelwork is designed for the dead load plus a superimposed load of 10 lb/sq. ft. together with an additional point load of 200 lb.

I must apologize for giving the total weight of building steel as 1,620 tons; this should have read 1,100 tons. In comparison with Orlando therefore, the weight of steel in tons per 1,000 cubic feet of building volume is 0.68 for Bloemfontein as compared with 0.86 for Orlando.

Both Mr. Sibson and Mr. Mitchell refer to the use of reinforced concrete as against steel frames for the main buildings. It seems to be generally agreed that some financial saving can be achieved by using reinforced concrete, but other practical considerations affect the choice. These factors include factor construction and earlier availability of the turbine house crane and the greater ease of routing and hanging of pipework, an important point during the design stages of a power station. These considerations apply more particularly to the initial stage of a power station and under present conditions are of some importance due to the rapid increase in load and the necessity to have plant commissioned as early as possible. A further point which has some bearing on the question of reinforced concrete versus the steel frame is the availability of materials. While there have been shortages of structural steelwork there have also been shortages of reinforcing steel and cement. In the case of the latter there is at present a cement shortage in certain parts of the Union and which is at the time of writing actually being experienced to an acute degree by the Civil Engineering Contractor.

Without working out the cost in detail, it is very difficult to give any reliable figures for the relative cost of reinforced concrete and steel frames since these depend to an appreciable extent on local conditions. I would mention, however, that the cost of the superstructure in relation to the overall cost is relatively small and if reinforced concrete achieved a saving on the superstructure of say 30 per cent, the relative importance of this percentage is illustrated by a saving on the whole station of some 3-4 per cent.

POWER STATION COSTS

The details of costs given by Mr. Sibson and Mr. Mitchell are of considerable interest. I feel that one must be very cautious in making overall comparisons of costs, particularly when these are based on lb/kW installed turbo-alternator capacity. Individual conditions at different

stations differ quite appreciably and to make a full comparison account must be taken of factors such as the amount of spare boiler capacity provided, the extent of the coal and ash handling equipment considered necessary, including the provision for existing plant and future extensions which may be included, the extent to which the site has had to be cleared and developed, the type of foundations required to suit the ground conditions, the situation of the site and the architectural treatment of the buildings to meet local requirements, the layout of the electrical equipment and the extent to which distribution equipment is located at the power station.

COAL HANDLING PLANT

The elevated coal bunkers are gunnite lined, the 2 in. thick lining being reinforced with expanded metal.

In reply to Mr. Fraser and Mr. Gripper's queries regarding the unloading of coal, I would mention that it is removed from the trucks either by the transporter grab, which feeds it direct to the belt adjacent to the coal boot, or by lashing out manually into the coal boot, or both. It is intended that a small labour force will be carried to lash out the coal from the trucks and that the transporter will not be the sole means of unloading.

The capacity of the coal store with coal at a depth of 13 feet is 27,000 tons. Provision is being made for a suitable water supply to be available for fighting any fire which might break out in the coal store.

BOILER PLANT

No difficulty has been experienced with the plate type air heaters to be used. The temperature of the inlet air will be 130°F, recirculation being adopted for use at light loads thus guarding against deposits in the air heater. It would be of interest to hear from Mr. Sibson of the troubles experienced with air heaters at Bulawayo and I should also like to know whether recirculation has been adopted there.

In reply to Mr. Gripper I would say that there is no difficulty in disposing of the ash in Bloemfontein to building contractors and other users who take their own delivery.

PIPING

Particulars of the steam conditions at both boiler and turbine are given in Table I from which it will be seen that the temperature at the boiler stop valve is 825°F. The maximum temperature it is ever likely to obtain is 850°F and in reply to Mr. Sibson I would mention that no desuperheater or temperature control is installed.

Mr. Fraser's comments on corrosion fatigue are of interest and I would say that the entry of all steam pipes into the steam range is from the side and all such pipes are effectively drained at the isolating valves before the range. No special provision has been made for internal examination of the range at branch points but in any case it is possible to obtain access to these points.

TURBO-ALTERNATORS

I agree with Mr. Mitchell regarding the desirability of installing barring gear for sets of 15 MW capacity and this will be included on the sets of this size at this station.

CONDENSATE AND FEED SYSTEMS

The floating decanting arms in the hotwells are intended to improve the operation of the overflowing hotwell system (or semi-closed feed system) which is installed and, as Mr. Mitchell knows, is similar to that used in the No. 2 power station at Salisbury. With this system some degree of de-aeration of hotwells can be achieved normally, but in the event of a large draw off from the hotwells, that is just when the water is required in the condensate system and boilers, no overflow and therefore no de-aeration is affected. The floating decanting arm is merely a floating pipe, with holes along its length, through which water is led away to the condensers. There are regulating valves in each of these pipes and at its maximum it is unlikely that more than 5 per cent of the condensate flow will be decanted. In any case this decanted water led to the condensers will raise the water level therein and the extraction pumps will automatically pump the water back into the condensate system where,

if it is not required in the boilers, it will return, de-aerated, to the hotwells.

The chemical dosing of the condensate system is a widely used feature in power station practice both here and overseas and it offers certain obvious advantages over direct dosing to the boiler drums. The chemicals used in the low pressure system are caustic soda to control alkalinity and, possibly, sodium sulphate for elimination of O_2. This latter chemical will be used only in emergency since it is hoped to eliminate O_2 mechanically in the condenser. The direct injection to the boiler drum will be for phosphate dosing only which is used to cover cooling water leakage, evaporator priming or mal-operation of the water treatment plant, etc., and which has to be fed direct in order to avoid deposits in the feed lines.

Finally, under this heading we come to Mr. Mitchell's comments on oxygen leaks. My reference to dissolved oxygen recorders easing the tracing of air leaks in the condensate system was intended to be a relative statement only and was so qualified. What is actually meant is that a recorder giving instant indication of air leaks, with provision for indicating which part of the system is at fault does represent a considerable improvement of having no indication whatsoever with the result that the station often operates blissfully unaware that any fault exists. As for the suggestion that no dissolved oxygen recorder works properly, this is perhaps rather harsh since these instruments are in common use, effectively, in power stations throughout the world.

It is true that they are not easy to maintain but they are certainly not impossible and when they are correctly used they are an invaluable part of power station equipment. Modern developments in the generation of electricity lean more and more towards automatic control of plant and if we are to benefit from this we must strive to operate plant in this way thus resulting in reduced operating costs. The efficient maintenance of instruments will assist considerably to this end.

C.W. SYSTEM

The water used for condenser cooling at Bloemfontein will be sewerage effluent and, at present, is untreated. Sewage effluent introduces quantities of nitrogeneous substances and in addition there are bacteria and nitrates, all of which are superimposed on the basic water. The sewage processing which tends to modify the salts in the water often results in a water with reduced temporary hardness and increased permanent hardness. The organic growth, whilst tending to soften scales usually causes general fouling and is best overcome by chlorine injection. We are at present examining proposals for chlorine injection, which may also include for the manufacture at the power station. Both Mr. Sibson's and Mr. Mitchell's experiences with their circulating water are of interest but we do not anticipate any diccifulty due to scaling of tubes.

ELECTRICAL EQUIPMENT

In reply to Mr. Gripper, alarm and indicating devices are normally provided in the inlet and outlet ducts in the alternator air circuit and are, in fact, provided at Bloemfontein.

Mr. Gripper has also queried the type of contactor starters used in the various motor circuits and I would mention that these vary with the nature of the plant served. Some of the starters are of the normal holding type but these are associated with unessential auxiliaries only. Certain main auxiliaries such as C.W., boiler feed and extraction pumps are supplied direct from the station and unit boards through air break switchgear. The other essential auxiliaries such as boiler fans, etc., are fitted with contactor starters of the latching type.

PRESIDENT: The next item on our Agenda is the Engineer's Forum. Mr. Mitchell will you kindly take over.

Mr. J. E. MITCHELL (Salisbury): Mr. President, Gentlemen: Last year, we for the first time inaugurated this Engineer's Forum. Mr. Kinsman was appointed our Quiz Master and it was my idea that Mr. Kinsman should just carry on with this job for a number of years, but I have been over-ruled as it was feared that Mr. Kinsman might bring in a commercial aspect or even a political aspect into this Forum, and I have been appointed as the

new Quiz Master and Mr. Kinsman has now been appointed an Honorary Member.

The first question is from Mr. W. G. Thackwray the Engineer of Kokstad, in regard to his trouble with severe localized corrosion of cylinder liners in Diesel Engines. He put this question to the Engineer's Forum last year, but never received a satisfactory answer. He was asked to see whether the makers might not help him out, and I will leave it to Mr. Thackwray to give you full details of the further steps he has taken and then see whether any of our members can assist.

Mr. W. G. THACKWRAY (Kokstad): Mr. President, Gentlemen: What is the cause of severe localized corrosion on one side only of the water surface of each cylinder liner of a diesel engine, and how can the trouble be overcome?

At the A.M.E.U. Convention in April last year I mentioned the trouble which we are experiencing with corrosion of the cylinder liners of one of our diesel engines.

Up to the present time we have not arrived at any satisfactory explanation, or solution for the phenomenon.

The second set of liners fitted were found to be similarly attacked after only 2,000 hours running.

With the original liners the engine failed after 8,000 hours running. It was discovered that each one of the eight liners was corroded on the same side of the engine in a patch about six inches long by two inches wide — the corrosion was more severe on some liners than on others.

The cooling water was analysed by a firm of industrial chemists who recommended the trial of zinc strips in the water spaces. Also the treatment of the cooling water with caustic soda, and with tannin extract in order to lock any dissolved oxygen in the water.

These counter measures proved ineffective as regards checking the corrosion. After examining the second set of liners at 2,000 hours, the corroded spot on No. 8 cylinder was turned to the opposite side of the engine — that is the water inlet side, and the engine operated for a further 250 hours.

On dismantling again it was found that the corroded spot had been covered with a thin sludge deposit, while on the opposite side of the liner again a fresh patch on the metal had appeared indicating that corrosion would soon be under way.

With these few particulars Mr. Quiz Master, I would like to know whether anybody present has had a similar experience, or may perhaps be able to assist me in further investigations.

I have brought some samples cut from a liner, also pencil rubbings of the actual corrosion spots; these are available for inspection.

Mr. J. E. MITCHELL: Is there anybody in the Hall who could actually assist Mr. Thackwray with this problem?

Mr. R. N. F. SMIT (Pretoria): Mr. Quiz Master, I have examined certain of the liners and the corrosion looks to me due to the aeration of the water. It is at a point of very low circulation, and I have suggested to Mr. Thackwray that if he could put in an elbow or deflector at the water inlet connection of the affected cylinders to throw the circulation water downwards, it might relieve the stagnation here and it may solve his problem. In addition I would suggest that he paint the affected part with a graphitic paint which is usually effective or with a graphitic paint mixed with about 10% zinc oxide. I have found this very effective in dealing with obstinate cases of corrosion in boilers. Mr. Thackwray perhaps these two little dodges may solve your problem.

Mr. J. E. MITCHELL (Salisbury): No further comments? Then I would like to say that Mr. Thackwray has given me the details of his trouble and I have had a look at the sample. I would agree that it seems definitely due to entrained air, due to the fact that there is a low circulation point, and a potential hot spot at that place, but I would suggest to him that many similar engines must be operating satisfactorily, as the manufacturers have an excellent reputation. No modification of the design of the cooling water system by an addition of further cooling water inlet points should be necessary if the cooling water system is in order.

The total quantity of cooling water circulated by the pump should be measured and this figure compared with the manu-

facturers' design figure. If this proves to be too low, the cause must be ascertained. A clue could be afforded by the temperature rise of the cooling water.

Possible reasons for an insufficient flow of cooling water to the cylinder jacket could be either choked pipes or passageways in the cooling water circuit, or a defective cooling water pump. I would suggest that the circulating water pump be carefully dismantled and thoroughly examined, as the trouble may lie in this. It could be that it was running too slowly, due to incorrect pulley sizes, if it is belt driven.

Mr. MITCHELL: The next question comes from Mr. G. B. Heunis of Standerton. He has put us a question in regard to the position of poles in front of owners premises.

Mr. G. B. HEUNIS (Standerton): Mr. President, Mr. Quiz Master, Gentlemen: It is found occasionally that owners of premises in front of which an overhead power line passes require electric poles to be moved for various reasons of which the most popular is that a run-in for transport is required.

In the absence of local regulations to control such cases I would be pleased to hear what other undertakings do to satisfy such applicants as uneven spacing of standards would certainly have a very untidy appearance and would particularly affect the appearance of street lights during the night if these are spaced unevenly.

There are of course two distinct cases to be dealt with namely :—

(a) Built-up premises, and
(b) Open stands.

Mr. MITCHELL: I am sure a great number of our engineers have been confronted with a similar problem and it will be very interesting to hear all the comments. Over to you Gentlemen!

Mr. K. W. J. HALLIDAY (Port Shepstone): I am afraid down in Port Shepstone we are rather co-operative in that, if inspection shows no alternative access at an open stand and a request occurs then we move the pole away. If change of or additional access is requested, then the applicant pays. The distance moved is relatively small so no difficulty is experienced with the uneven spacing.

Mr. J. L. VAN DER WALT (Krugersdorp): In Krugersdorp we are less lenient than what they are in Port Shepstone. We make them pay in all cases. It is a case of first come first served. If an owner builds after we have already put in our poles and he then makes his entrance opposite one of the poles — if he applies we will transfer it to some other position — but he will have to bear the cost.

Mr. A. R. SIBSON (Bulawayo): Mr. Heunis of Standerton has referred to the difficulty arising from poles fouling entrances to premises. I don't know whether our friends, the Town Planners, have been busy in Standerton as yet, but in Bulawayo we have been fortunate in having building stands with a uniform frontage of 100 feet. By making span lengths 200 feet — which has become our standard length — all poles can be planted on stand boundaries, and owners can easily arrange their driveways so as to avoid them.

Mr. MITCHELL: Thank you gentlemen — the next questions come form Mr. Bahr of Ventersdorp. He has put the following two questions to our Engineer's Forum.

Question 1 : What legal means are available to make the owners of *occupied* dwelling houses and other premises realize that their electrical installations must be put in order to satisfy the regulations as amended to date, after definite, yet polite requests to do so were sent to them by the Local Supply Authorities, and disregarded?

Question 2 : What steps could be taken to comply with the Electricity Control Board's request for regular routine meter testing, when the Engineer's modest requisitions for suitable accommodation and a suitable meter test bench are not accepted, the costs being declared prohibitive?

Mr. MITCHELL: Have we any answers to Mr. Bahr's first question?

Mr. K. W. J. HALLIDAY (Port Shepstone): If the installation is unsafe, one must disconnect the supply, but if it only

does not comply with an amended regulation, I do not think you can scare the owners by telling them you will be taking legal action. May be if you sent an insurance agent to their homes and he told them he would not insure their buildings unless the place was re-wired, you would find that they will have the place re-wired soon enough.

Mr. G. J. MULLER (Bloemfontein): In very dangerous cases, it is our duty to cut off. We have our responsibility in the matter, however, where it is considered there is no immediate danger we have written to the respective owners and told them that we have inspected their premises and found that the premises require rewiring and that a copy of the letter would be forwarded to the Government Inspector of Machinery for information. That has invariably brought response.

Mr. J. INGLIS (Pietersburg): It appears to be the trouble that faces smaller Municipalities, and although Bloemfontein has answered this question quite satisfactorily, it would seem that the old old problem of Municipalities exercising their responsibility and duties still exists.

Mr. President, there is another way of approaching this matter. We send out notices to consumers advising that the installation is in a dangerous condition, or contrary to the wiring regulations and setting out the steps necessary to rectify the matter, for which reasonable time is given, unless the installation is really dangerous. We also point out that this is in the consumer's own interest as a fatal accident may occur, and also that the wiring regulations were framed to protect the consumer and not to create a hardship. This approach invariably brings response.

Mr. J. E. MITCHELL: Thank you gentlemen — we shall now deal with the second question put by Mr. Bahr.

Mr. H. R. W. M. BAHR (Ventersdorp): Mr. President, you will remember that when the Convention was held in Pietermaritzburg in 1950, it was decided that Municipalities must test their meters and if they had no suitable testing apparatus they would have to send them away to be tested. Sending Eletricity Meters away for repairs and/or testing proves too great a hazard. A case of 24 meters, carefully packed, was returned from a Meter Testing Engineering Firm. The cartage contractor accepted the case from the S.A.R. & H. without having inspected it and signed the receipt. Most of the meters were damaged beyond repair.

I approached my Council to make funds available for a meter testing plant, but they say it will cost too much money, and do not want to grant this. I believe that if we again have to send meters away to be tested, they will be returned damaged.

Mr. J. W. SWARDT (S.A. Bureau of Standards): Mr. Quiz Master, I was dreading this! I think it is necessary to have the meters properly packed when they are to be sent away. I know there is a lot of difficulty in this because goods often receive rough handling in transit. The Bureau is designing a proper box in which to transmit and details of its construction may be had on application to the Bureau.

Mr. MITCHELL: Mr. Bahr would you put your third question to this gathering?

Question 3: Is it advisable to lay portions of a town's water reticulation system (galv. pipe) across the earthing wire system of an 88,000 volt line? The writer is of the opinion that during the dry season a flash-over might take place and endanger the lives of human beings or animals being in simultaneous contact with that pipe-line.

A little while ago two bulls were bought by Ventersdorp Municipality. To furnish these bulls with a regular supply of water, a galvanized pipe line had to be laid and the mechanic was instructed to avoid the earthing wires of the E.H.T. Substation. During my absence a Councillor instructed the mechanic to lay the the pipe diagonally across the wiring system; he probably thought of saving some fifty feet of piping, without realizing the dangerous possibilities of human beings or the two bulls being killed.

Mr. J. C. FRASER (Johannesburg): It is common practice to prevent flash-over between the wire and pipe in such cases by enclosing either the pipe or the earth wire in a 4 inch concrete pipe for

about 10-20 feet at the point of intersection.

Mr. H. R. W. M. BAHR (Ventersdorp): Unfortunately, the earth wire belongs to ESCOM; we have no control over the earth wire.

Mr. W. H. MILTON (Escom): You could put that question to the Rand Undertaking of Escom.

Mr. MITCHELL: The next question is in regard to the cutting of trees — this question is put by Mr. Futcher of Kempton Park.

Question: Should not a clause be included under Chapter III, Part 3 of the Factories, Machinery and Building Work Act or Local Government Ordinance, whereby the "Supplier" is empowered to cut or trim the branches of any trees, growing on private property, which may be dangerously close to or interfering with the conductors or an overhead distribution line.

The proposed clause could be included as sub-section (c) of section 70, or part of sub-section 46 of section 79 of the Local Government Ordinance.

Sub-section 46 of Section 79 of the Local Government Ordinance makes provision for the cutting or trimming of any trees which may in the opinion of the Council cause any danger to traffic or to drains but no reference is made to electricity distribution lines.

Section 79 does not give the local undertaking the right to cut away trees which are obstructing overhead lines. I would very much like to know what procedure we are allowed to follow.

Mr. R. N. F. SMIT (Chief Inspector of Factories): This question was passed on to me by your Secretary, Mr. Taylor. Section 70 (a) reads :-

> "The user shall cause all electrical apparatus and conductors to be so selected, arranged, installed, protected, worked and maintained as to prevent danger to persons as far as practicable".

My department considers that as far as we can go, we have passed the buck to the Supply Authorities. We feel, if they cannot pass a by-law, they should approach the Provincial Council. We cannot do anything further at this stage.

Mr. F. W. P. HALL (Somerset West): It seems that we in the Cape are slightly more advanced than in the Transvaal. We have a regulation in which there is a clause, that if any tree obstructs overhead lines, the owner can be ordered to cut that tree. We send a notice out to the owner to have the tree cut, and if he ignores our notice, we have the right to cut the tree at the expense of the owner, if convicted in court, but in actual practice we just cut the tree since the Council does not take the case to court.

I definitely think there should be some clause in the Electricity Act or Factory Act referring to the cutting of the trees.

Mr. R. N. F. SMIT (Chief Inspector of Factories): In reply to Mr. Hall of Somerset West, I will read the regulation again :-

> "The user shall cause all electrical apparatus and conductors to be so selected, arranged, installed, protected, worked and maintained as to prevent danger to persons as far as practicable".

Mr. D. A. BRADLEY (Port Elizabeth): I suppose the answer lies in the necessity for Property Owners being compelled to restrict any obstruction — in this case trees or branches — overhanging the property line. This is the attitude I would adopt.

Mr. C. R. HALLÉ (Pietermaritzburg): We have a by-law whereby consumers must keep trees clear of overhead lines. If we find a tree encroaching on an overhead line, we tell the owner that he must remove it or we will cut it down. We have no trouble with this in our town.

Mr. W. H. MILTON (Escom): When Escom undertakes the supply of electricity in an urban area, provision is made in the agreement with the Local Authority for the introduction of a bye-law preventing the interference under discussion and empowering the Local Authority and Escom to cut and trim trees as required without compensation.

Mr. MITCHELL: In the Southern Rhodesia Electricity Supply Act no. 19

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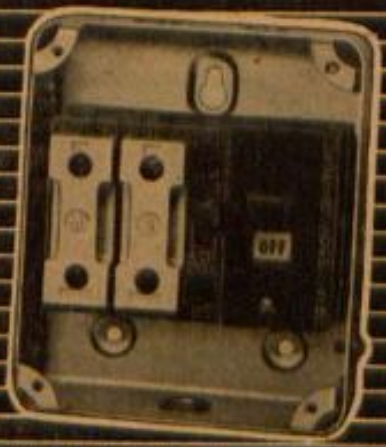

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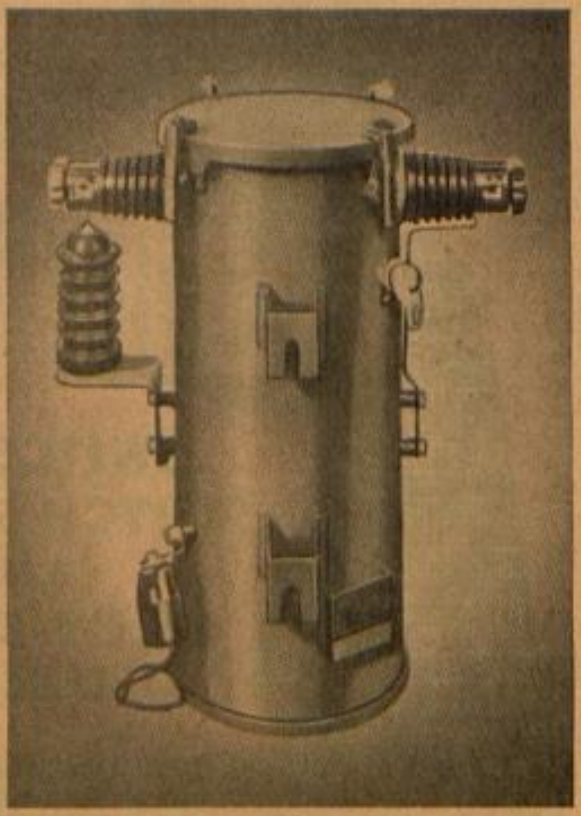

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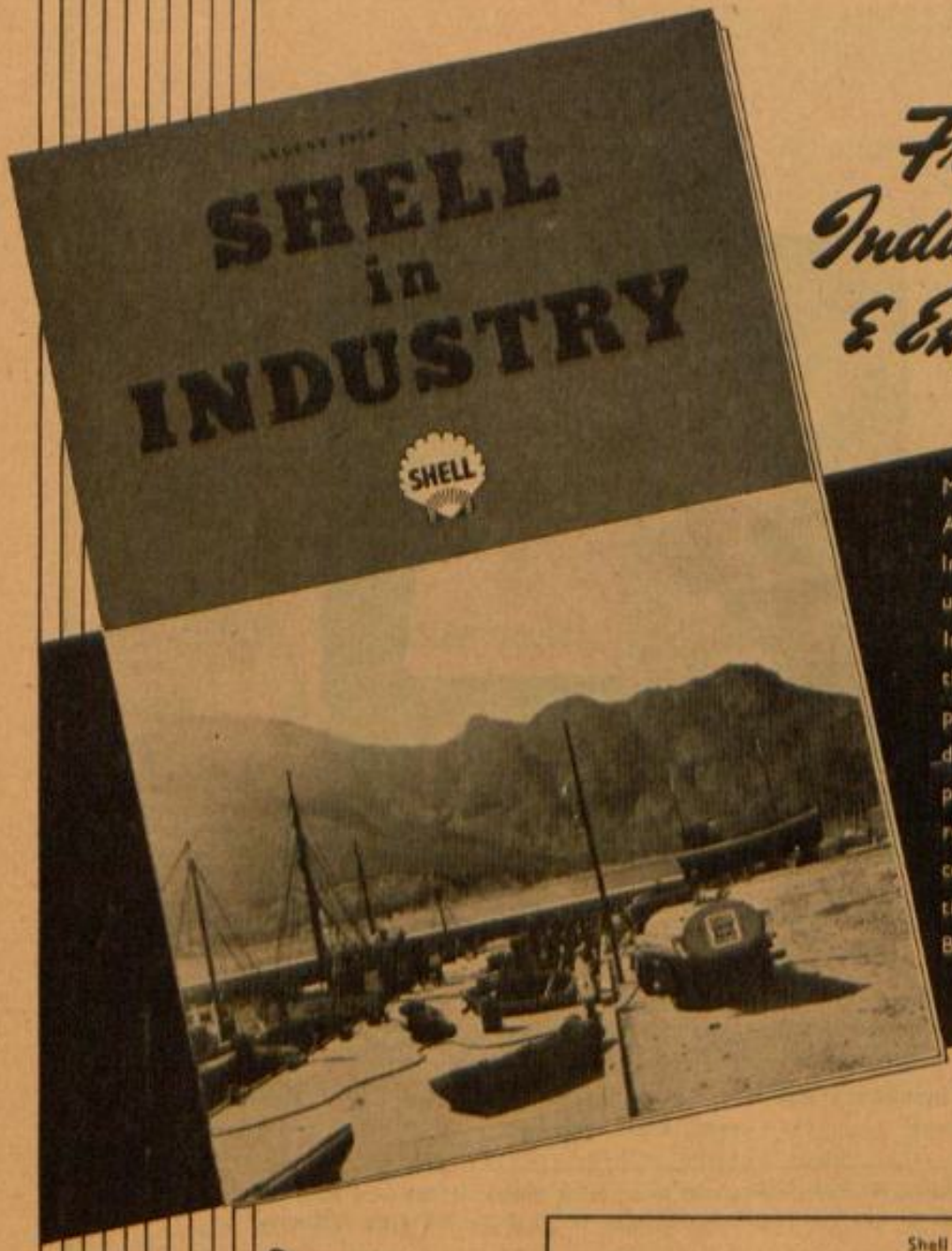

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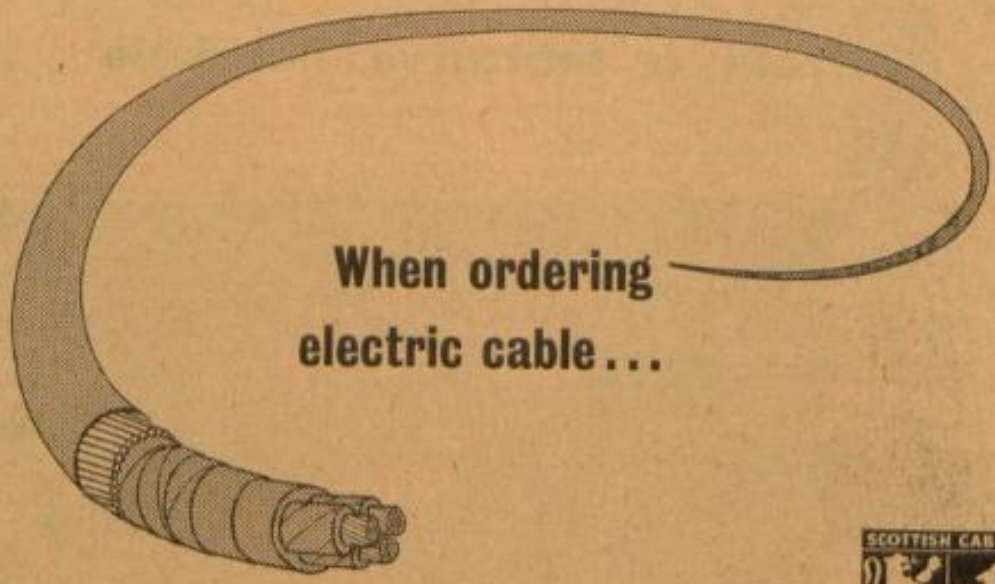

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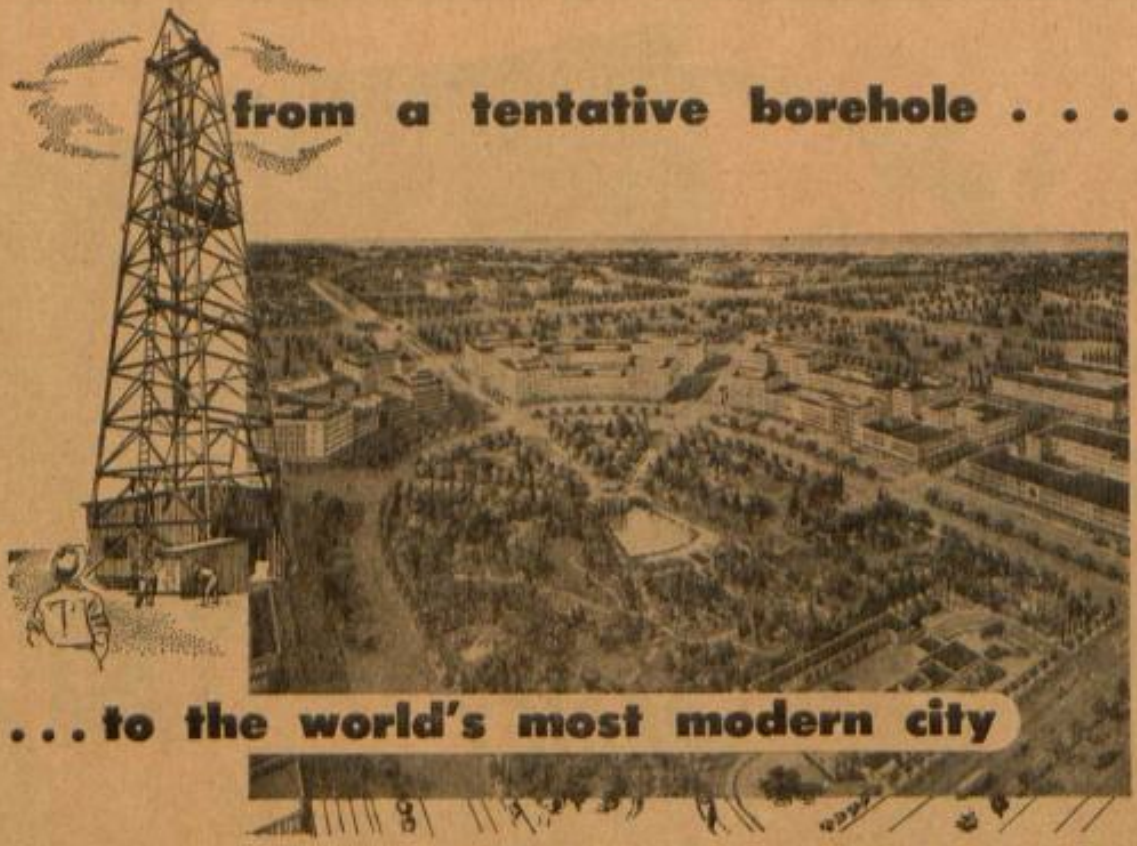

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of 1951, there is a section (41) which deals with tree cutting, and which reads as follows :-

"(1) Trees or undergrowth on any land, including Crown land, which obstruct or interfere with the working or maintenance of any electric line or which interfere with the construction of any electric line shall, on the written request of the licensee addressed to the owner or occupier of the land upon which such tree or undergrowth are situated and at the expense of the licensee, be cut down or trimmed by such owner or occupier within such reasonable time and in such manner as may be requested by the licensee.

(2) If any owner or occupier fails to cut down or trim any trees or undergrowth within the specified time and in the manner requested by the licensee, or if immediate action is imperative to protect any electric line from any trees or undergrowth on any land, the licensee may, without further or any notice in writing, as the case may be, to the owner or occupier of such land, enter upon such land and cause such trees or undergrowth to be cut down or trimmed in such manner as may be necessary.

(3) In this section —

"Licensee" includes a local authority supplying electricity within the area under its jurisdiction:

"Owner", in relation to Crown land, means the Minister of Agriculture."

The linesman carries round with him a book of printed forms which he can deliver to the owner of the property, asking him to give his signature to a document giving this permission. If the necessary permission is not granted, and the owner of the property does not remove or cut or trim the trees himself, then the necessary action is taken under the Act.

Mr. MITCHELL: The next question comes from Mr. J. A. Mathews of Uitenhage and is in regard to the extension of electricity services outside Municipal Areas.

Mr. J. A. MATHEWS (Uitenhage): My Council is at present negotiating with certain rural consumers for making supply available to them by extensions from the existing network. In continuation of its previous policy, my Council desires that these remote consumers pay in full for the cost of the extensions, and at the same time it undertook to ensure that for a period any additional consumers connecting to this extension would have te refund to the original consumers a pro rata share of the costs of the original extension. This was intended to protect the original consumers against unfair burdens in pioneering the extensions.

In an earlier agreement entered into with a rural association of consumers, the Administrator permitted a compensationary clause of fifteen years duration being inserted in the agreement.

Without any knowledge to the contrary, my Council, when dealing with the present applicants, agreed to provide the same facilities for compensation as in the first agreement.

When the Council submitted the latest agreements for approval the Administrator was not prepared to permit any compensation clause being inserted in the agreement. However, in this instance, following upon representations, the Administrator did permit a compensatory clause for a period of six years, but has advised the Council that future clauses of this nature must not be included in agreements.

It being my Council's policy that for rural extensions the full capital cost must be paid for by the applicant, a very unsatisfactory position must arise. As it appears, my Council must either permit the additional consumers to connect without payment, and thereby experience difficulty in finding a first consumer for any extension, or it must deal with rural associations, a method which, by experience, is not altogether satisfactory. The present policy will, without doubt, restrict the development of rural areas by supply authorities, an aspect which is receiving a large degree of publicity at this time.

Mr. BRADLEY (Port Elizabeth): Mr. Mathews, who I had the pleasure of having on my Staff for some years, knows the procedure adopted in Port Elizabeth regarding the guarantees, payable monthly over a four-year period, for electricity consumption to recover the capital expenditure involved in Mains Extensions, with pro rata deductions made when any additional consumer is connected to the extension. Now, according to Mr. Mathew's explanation, it would appear that the first Applicant will be required to pay the full cost of the extension without any hope of financial assistance should any other consumer, because of the siting of his premises, have the use of the extension. This would not seem to be equitable.

Mr. J. L. VAN DER WALT (Krugersdorp): We have found by experience that if the first consumer has to pay all the costs when initiating the extension, then to be refunded as other consumers are supplied, it can become a very complicated affair. We have had a case where the original consumer was still claiming refunds after 25 years.

I am of the opinion that it is a much sounder policy in the case of a small extension to charge a monthly minimum per consumer, so as to make the extension payable. This minimum may be reviewed annually, depending on the number of consumers.

For larger schemes, involving companies or large groups of consumers, a proper agreement should be entered into, whereby the Company or group advances the funds free of interest, and the Council refunds this amount according to a formula based on payability.

Mr. H. J. GRIPPER (Port Elizabeth): In fairness to Mr. Van der Walt I would mention that the scheme now adopted in the areas of Port Elizabeth and Uitenhage recently should not necessarily be taken as establishing a new principle. For my part I do not consider that the Union Treasury would limit the raising of capital for essential electricity extensions if the matter were put to them specifically. I am firmly of the opinion that the Electricity Undertaking should be looked upon as a normal business except that it is sufficient if the capital outlay is turned over every four years. This can usually be ensured by obtaining a suitable guarantee from the consumer.

The problem does arise after the first consumers have given such guarantee as to how other consumers are to be treated but this is by no means insurmountable.

I am firmly of the opinion that it is wrong only to provide extensions to those particular consumers who require the supply so urgently that they will provide the initial capital irrespective of whether they are to recover this capital or not. If they are to recover it, the Undertaking will presumably have to make provision for this out of revenue which is, to say the least of it, somewhat irregular.

Mr. W. H. MILTON (Escom): In connection with this problem I have a recollection that one or other of the Provincial Administrations raised the issue on the basis of the onerous nature of the terms laid down by certain Municipal Authorities when dealing with consumers outside their area of jurisdiction to whom they intended to supply electricity in terms of a permit or permits obtained from the Electricity Control Board, in terms of the Electricity Act.

The question of financing these supplies into the areas outside the area of jurisdiction of an urban Local Authority does present a very real and difficult problem.

Looked at from the point of view of an extension to a single consumer with no other supplies likely to be taken from the extension, the problem that does arise occurs when change of ownership takes place. If the original owner has provided the whole of the capital to meet the cost of the extension, the ownership of the transmission line when the property is transferred can become complicated unless some specific mention is made of ownership in the original supply agreement, which is then made known to the new owner at the time of purchase.

Complications also vary with the conditions attached to the original capital payments. If the consumer is required to pay outright for the extension and there is no intention to reimburse the consumer, ownership questions crop up. Having

paid for the line, the consumer is apt to regard it as his property (with considerable justification). On the other hand, as it is essential to the supply and must be maintained by the Supply Authority, it is desirable that ownership should vest in that Supply Authority. Bearing in mind that the extension will serve the property for as long at it lasts in to the future, this is not such a peculiar requirement as might at first appear, because the resident on the property will continue to enjoy the benefits of the existence of the extension throughout its life, and ownership of the asset is of no great importance except in so far as it will probably establish rights and obligations in respect of maintenance and replacement.

Where provision is made for refunding the consumer the amount of capital provided by him initially to finance an extension, change of ownership of the property may introduce considerable difficulty. If a refund is due, then at first sight the person advancing the money is the party entitled to the repayment. If the repayment is incorporated with the tariff for the supply of electricity, however, on change of ownership there would require to be a change of tariff if the original owner is still to receive a refund because the extension is still used to supply a consumer (that consumer being the new owner or occupier). The terms of supply therefore require to be altered with the change of ownership. The new owner, however, may have been advised by the original owner of the terms of supply of electricity, and those terms may have been taken into account by the new owner when purchasing the property, and any change in the terms of supply might be regarded as prejudicial to the new owner, and therefore the purchase may be regarded as having been made under false information. It therefore becomes necessary to ensure in some manner that, when ownership of such property changes, the new owner is made fully aware of the conditions relative to the financing of the extension.

This problem is, of course, aggravated when a deceased estate or heirs become involved.

When a line financed originally by the initial consumer is later used to supply other consumers, the question of apportionment of the original payments between the new users to the benefit of the original user may sound simple of solution, but the application of the solutions arrived at almost invariably lead to trouble.

It may be of interest to members to learn that the Commission has in recent years introduced a purchase agreement to cover cases of extensions which require to be financed by the consumer in part or in total.

In terms of these agreements, the consumer provides the transmission line extension making use of Escom as the contracting party for the construction of that extension. Escom then purchases from the consumer the extension, the payments being spread over a period of years and comprising equal instalments of principal and interest at an agreed rate of interest.

In this way, the financing of the extension is made an entirely separate issue from the supply of electricity, and the repayments will continue to the particular person from whom the extension system is being purchased ab initio. Transfer of property does not involve a transfer of the repayment to the new owner of the consumer premises, although it would be possible for the original owner by agreement with the Commission, and the new owner to have such a purchase agreement transferred, the new owner reimbursing the previous owner the oustanding amount on capital account, either at a premium or a discount, depending upon the private arrangement for purchase as between the two owners of the property in question.

If such a line is used to supply additional consumers, the repayment system is unaffected, the original owner still being repaid in full the amount of the original agreed instalments of principal and interest. The original owner is, of course, compensated by reason of an adjustment on his electricity account in respect of the monthly costs and the amount paid by that consumer, additional to tariff rates, on his electricity account would be adjusted on a relative user basis to ensure that those additional costs are reasonably shared between the old and the new consumers.

It seems to me to be most unfair that

no arrangement can be made by a Municipal Authority in the circumstances quoted by Mr. Matthews (Uitenhage) for the reimbursement of the original consumer or consumers as a result of the acquisition of additional consumers supplied over the original extension network. It may be that it is in respect of the capital account that this restriction has been imposed in order to avoid the difficulties which arise with change of ownership when reimbursements of capital are made part and parcel of the electricity supply agreement. In view of what I have already said, I can appreciate restrictions in such a case. If the capital payments are kept as an entirely separate issue from the electricity supply terms, then the original owners will receive benefits from the acquisition of new consumers at the discretion of the Supply Authority by way of the actual electricity supply terms, leaving the capital issue to be dealt with entirely with the original owner without modification.

Mr. MITCHELL: We now come to the end of our Engineer's Forum. I would like to thank all those Engineers who partook in the discussions for their contributions. I think our Engineer's Forum has been very successful. Thank you all once more.

PRESIDENT: On behalf of the organization, I would like to thank you all for taking part in the Engineer's Forum, and I particularly would like to thank Mr. Mitchell for the very able manner in which he conducted the quiz. You may be roped in for this job again.

ADJOURNED FOR LUNCH

2.30 p.m.

PRESIDENT: Gentlemen: We will resume with the business of the Convention — this afternoon we have the pleasure of having a lecture by the National Occupational Safety Association. Dr. Berliner will you kindly take over.

NATIONAL OCCUPATIONAL SAFETY ASSOCIATION

Address by

Dr. H. N. BERLINER, B.A., B.Sc., Ph.D., A.M.I.E.E., A.M.I.Mech.E.

THE NECESSITY FOR ORGANISED ACCIDENT PREVENTION IN INDUSTRY

It is indeed a great pleasure to have been invited by this Association to participate in your Annual Conference, and to address you on a subject that of necessity must be of vital interest to every Engineer. You have already considered during this Congress addresses and papers on a variety of topics appertaining to the technicalities and economics of your industry and it is thus appropriate that we should at this point turn our attention to another topic of direct importance to this major industry in South Africa — namely the necessity of organised accident prevention. This is a subject which might have been taken up equally well from the point of the medical research worker or the industrial psychologist. I propose to deal with it as a Production Engineer concerned with finding a practical solution to a major problem. I shall review, first of all, the cost of industrial accidents; secondly, the human factors with which we are concerned in accident prevention; and thirdly, I shall outline the possibilities in different methods for accident prevention.

THE COST OF INDUSTRIAL ACCIDENTS

We are interested in the prevention of industrial accidents, firstly, as a means of reducing human suffering and loss, and secondly as a means of reducing the loss of productive time and damage to equipment to a minimum. It is impossible for us to assess the full cost of human suffering; and the monetary compensation for accident disability, based upon loss of earning power, is no measure of the suffering entailed by the injured worker. The human being is highly complex and sensitive; and the shock, both mental and physical, of an accidental injury can never be fully

assessed. Furthermore, the human suffering caused by the industrial accident may often extend beyond the person immediately involved to those closest to him in the home and factory. Quite recently my attention was drawn to a case where a father and mother suffered disability accidents in succession, only a few days after their son suffered a serious accident in the same factory. The total cost of human suffering in these cases is beyond our human powers of assessment. The story of this human suffering is an aspect which is exceedingly important and ever uppermost in the mind of the Engineer, but to appreciate its significance we must attempt in some way to measure its affect on our industrial society.

Unfortunately in this country our advent on the world industrial stage is but recent compared to European and American nations; and particularly our efforts to prevent industrial accidents is just being shaped. It is for these reasons we have mainly to resort to "overseas" literature and statistics to ascertain what effects an industrial "way of life" has on the community and in this light to assess the tendencies in this country. It is hoped, that in the not too distant future, this lack of information will be effectively remedied and in this regard I am sure that a close liaison between the organisation (which I am representing today) and your Safety Precautions Committee can be of very great value. It is my hope that this will be established as soon as possible.

To return then to the problem of measurement. The extent of suffering and loss to be expected each year can be pictured more clearly if we summarise in round figures the accident statistics in terms of a typical engineering works. In a recent survey in Great Britain by J. M. Bull in a paper entitled "Industrial Injuries", it was shown that for every 1,000 workmen employed, accidents occur on average as follows:—

Every day—10 new injuries receive surgical treatment and 40 to 50 minor injuries occur.

Every week—1 serious accident will cause a loss of 10 to 20 days.

Every 2 years—1 major accident will cause permanent and serious disability.

Every 10 years—1 fatal accident.

That this picture is also probably representative of your industry, as well, in Great Britain, is borne out by comparing recently published statistics. In the engineering industry in which Mr. Bull conducted his investigations the frequency rate index of accidents for the year 1952 varied from 0.3 to 9.9 for 193 different establishments. In the case of electrical supply authorities the same index varied from 1.3 to 4.2 for 25 establishments. The latest figures which I have just obtained for the quarter ending December 1953, for the 14 divisions of the British Electricity Authority the index was 2.38 (21.35 million man-hours worked: 508 lost time accidents: 138.2 thousands hours lost).

I think it can thus be safely concluded, that the problems inherent in your industry, are of an order, that merits your close attention, in the same way, as it behoves your engineering colleagues in other industries.

In this country we have some evidence, that because of the rapid growth of industry during recent years — the index of employment in manufacturing and mining rose from 75 in 1938 to 121 in November 1953, and the index of current generated rose from 68 in 1938 to 141 in January, 1954 — we have both a responsibility to society and a challenge to our conscience, that cannot be neglected.

If the figures given above are any guide to the condition in this country — and I think they are — then this is surely a dreadful anticipation and our sense of social responsibility impels us to strive to reduce this incidence of injury by every means at our disposal. Taking the national picture as a whole, the lost time due to industrial accidents amounted to 17½ million man days in 1950, in the main industries. The estimated reduction in gross national output as a result of this lost time amounts to at least £96 million per annum.

An analysis of the cost of an accident made from sample studies indicates that

the major part of the cost arises from the loss of time caused to people other than the injured person, as follows:—

Cost of lost time by injured worker—15%.
Cost of lost time by other employees—36%.
Cost of lost time by foreman—25%.
Cost of spoiled materials and tools—6%.
Cost of compensation and tools—18%.

It is thus necessary to multiply the direct loss to the National Product by at least 6 fold to arrive at the total cost to the nation of time lost by workers suffering accidents. This is a conservative estimate; if we take into account the disruption of normal working during the shift due to minor cuts, bruises and falls and consider the effect of all such accidents on the subsequent performance of all persons involved, the total loss to the nation of accidents in mining, manufacturing and building will be greatly in excess of £96 million per annum as previously mentioned.

It is known that slightly over 13 days per annum is lost for each worker employed in industry in this country. There are over 1 million workers.

It is, therefore, against this figure that we must measure the cost of the organisations we have set up nationally and in individual firms to conduct research and to instruct managers and workers in methods of accident research.

THE HUMAN FACTOR IN INDUSTRIAL ACCIDENTS

Great progress has been made towards the safeguarding of industrial workers by means of protective clothing, footwear, gloves, aprons, and eye shields and by means of machine guarding and safety devices and by training in safe working methods; this progress can be measured in a reduction in the incidence of industrial accidents.

Accident figures are a challenge to everyone concerned in in providing safeguards and in devising safe working methods, but it is also important to find out the real underlying causes of these accidents by continuous study and research. H. M. Vernon in a survey has shown that only 20% of industrial accidents are the result of mechanical or electrical breakdown, failure of equipment, or the lack of machine guarding. The great bulk of accidents are the result of faulty judgement or lack of care on the part of the individual concerned or of others. Much useful information on the human factor in accident causation has been derived from the study of statistics and from research work carried out in factories in recent years. Most of this information has been published in the reports of Industrial Health Research units and elsewhere; it indicates the general direction in which we must aim in devising new improved methods of accident prevention.

This research work — although not more than a beginning — tells us a great deal about the interaction between the worker and his environment. Not only is the working effectiveness and output of the worker affected by abnormal physical conditions of temperature, humidity, lighting and noise, but it is also affected by the working pattern to which he conforms, or which may be imposed upon him. This working pattern is composed of the hours of work; the provision made for rest pauses and refreshment; the socially accepted normal and incentive working pace; the type and length of training given; the social or group attitudes to the job (this is exceedingly important in this country with our heterogenous working population); the accepted methods of performing the details of the task; and so on.

All these factors interact with each other and also with the individual worker's basic and developed human characteristics. Individuals are found to vary greatly in their physical and mental abilities to see and think quickly; to use their hands accurately and dexterously; in their strength and stamina; and in temperament; they also vary greatly in their ability to learn to use tools and complex equipment; to hear or to read; and to follow instructions and most of all, in their ability to learn from experience.

Dr. H. M. Vernon, one of the leading British pioneers in research on accident prevention, and other workers in this field, have shown that there is a direct

correlation between many of these factors and accidents in industry.

Taking only a few examples from the studies which have been made:—

EFFECT OF TEMPERATURE

Vernon and Osborne reported in 1922 the results of an investigation, which showed that there was an increase of 30% in accident frequency in factories when the room temperature fell to about 54°F or rose to 80°F, the minimum frequency of accidents occurred at temperatures between 65°F and 69°F. Further statistical studies on accident frequency in coal mines showed that the temperature effect was also related to age. These later studies showed that there was little difference in accident frequency between 25 and 55 years of age, as long as the working temperature did not exceed 70°F. At temperatures above 70°F, however, there was a marked increase in accident frequency with age, men of 55 having a 50% greater accident frequency than the 35 age group, in which the minimum frequency occurred.

EFFECTS OF HOURS OF WORK

Vernon also obtained some important data from his statistical studies in munitions factories, which showed the effect of length of working day upon accident frequency. He showed that the relative accidetnt frequency was 14% greater for men and 27% greater for women when working on a 12 hour shift compared with a 10 hour shift. Comparing the accident rate in the morning and afternoon showed that on the 12 hour day, the men's rate increased by 7% and the women's rate by 45% in the afternoon, while on the 10 hour day, the men's rate increased by 8% and the women's rate by 17% only. When the same workers were on night shift for 10½ hours, it was found that the accident frequency was actually more uniform throughout the shift, and lower on average than the 10 hour day shift frequency rate.

LEARNING ABILITY AND EXPERIENCE

One of the most important human factors affecting accident frequency is the learning ability and experience of the individual. It is difficult to separate these two factors but there is evidence to show:—

That the first 6 months of employment 50% of trainees had accidents.

That in the next 6 months 25% had accidents.

That after 2 years' experience less than 3% had accidents in subsequent 6 months' periods.

It has been shown that careful selection of employees, followed by induction training in safety precautions and rules and proper supervision during the early period can halve the accident frequency among newcomers.

These research studies show us clearly that interaction, which exists between the worker and his environment and the examples quoted are only a small part of the great body of information, which we possess today, as a result of many years of careful research on factors affecting accident frequency.

In addition to research studies of this nature, a great contribution to knowledge on accident prevention has been made in recent years by production and work study engineers. They are concerned with practical studies of plant layout and of machinery and tool design, not only with the object of increasing productivity, by reducing the human effort and fatigue involved in the task to a minimum, but also with the object of devising working methods and motion patterns, which are inherently safe to use. Unfortunately, much of this type of information has not yet found its way into print.

During the last war, a considerable amount of research work was concentrated on the physical and mental characteristics of workers and service personnel, who were required to work or use complicated equipment under abnormal conditions of temperature, pressure accelerations, blackout, fatigue, etc. For example, the Cambridge "Cockpit" has become famous as a method of studying the reaction times and responses of pilots to signals and indicators.

A new Society has recently been formed called "The Ergonomics Research Society" to continue this type of scientific

research and to co-ordinate the work of the Production Engineer, the physiologist and the psychologist and the anthropometrist, in the scientific study of the economics of human effort, known in the United States as "human engineering". This is of great importance in accident prevention since it is essential that the incentive task should be set and agreed at a "safe" level. For example if ergonomic studies show that the operator makes a greater number of errors, when the control lever has to be moved in the opposite direction to the indicator needle in a dangerous operation, then it is essential, that they should both be arranged to move in the same direction to avoid confusion and an accident.

The importance of this work is underlined by the estimate that every year more than half the accidents occur owing to what is termed "lack of care" in using hand tools, or in handling materials or in walking about. A great deal of fundamental "ergonomic" research has still to be done on the factors such as training, which influence human judgement of speeds and distance, and on fatiguing effects, which influence continuity of attention before we can hope to solve this type of problem.

The fact that so many serious accidents continue to occur for similar reasons and on the same types of machinery year after year, proves the need for the continual improvement of protective devices on the one hand, and for more effective organisation for the application of safety measures on the other. This is an organisational problem, which has been partly solved in a number of factories in recent years by appointing "Safety Officers" and "Safety Committees" to assist management and workers to reduce the accident risks of every job in the factory.

Quite apart from the question of designing and supplying machine guards, protective clothing and eye shields to workers in the factory, there is the major problem of ensuring that these protective devices are not skilfully circumvented or set aside, because they are irksome in some way to the user, or because the operator prefers to "take a chance" without knowing the odds against him. This problem can only be solved by bringing together the factory manager, the tool engineer, the protective equipment designer and a number of specialists including the medical and psychological research worker, the safety officer, the factory inspector and the worker himself on some new basis.

This again is a problem requiring research and organisation, but there is a growing body of evidence to prove that it can be solved effectively in a number of ways and at different organisational levels.

POSSIBILITIES IN ORGANISATION FOR ACCIDENT PREVENTION

From the above brief survey of the great wealth of knowledge on accident prevention, which has been built up by generations of engineers, medical research workers and factory inspectors from many industrial nations, it is now possible for any industrial group to commence an accident prevention programme.

It should also be clear that the aims of the programme should be to integrate any accident prevention proposals in the normal routine of the production. It should never appear to be an "afterthought" of management. Means should also be designed whereby the effectiveness of the programme can be continually assessed in the same way as management is always measuring the effectivity of its production and maintenance programmes.

The needs for an accident prevention programme was examined by the President's Conference on Industrial Safety in 1949-1950. This was sponsored by the United States Department of Labour and the National Safety Council of America. They recommended that an effective programme should ensure:—

1. The maintenance of necessary accident records and data.
2. The collaboration in job training programmes.
3. The collaboration in foreman and supervisory training.
4. The stimulation of and assisting in the preparation of safe operating rules.
5. The preparation and supervision of the distribution of educational

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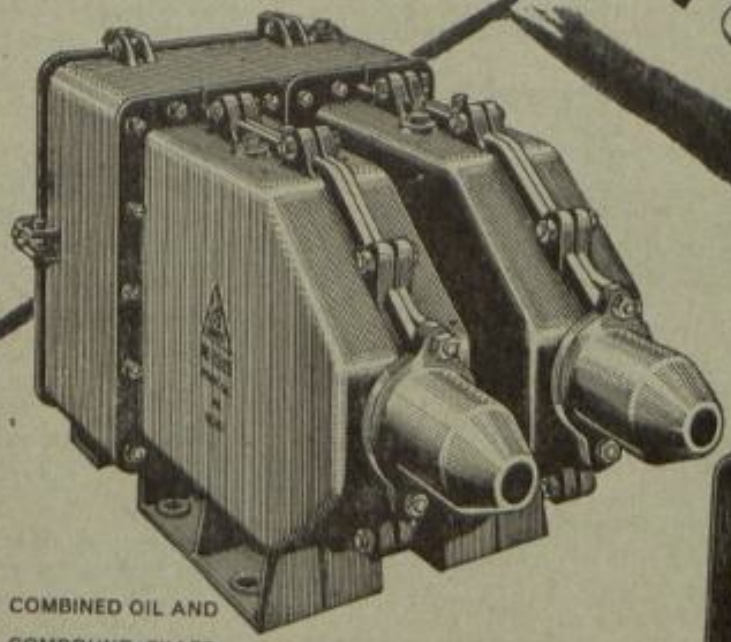

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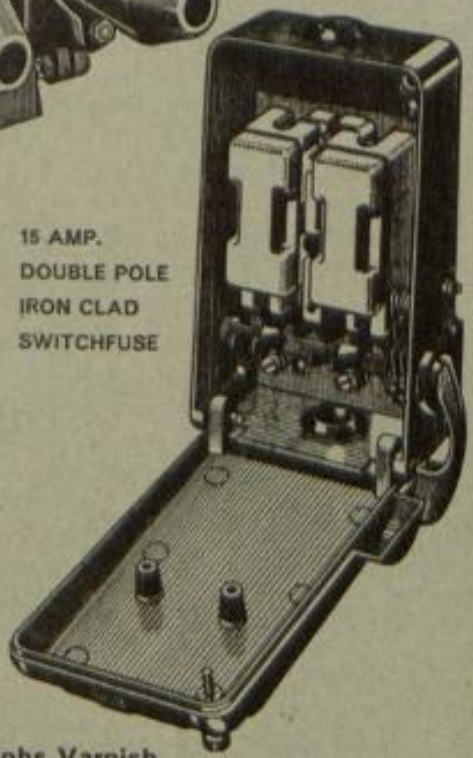

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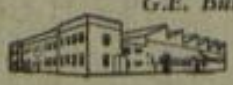

material as it pertains to specific hazards of the jobs.

6. That top management is continually advised of the progress of the over-all programme.
7. That assistance is available for the design of machine guards where it is necessary.
8. That information is available for describing and standardising the necessary personal protective equipment.
9. That provision is made for the investigation of all injuries and accidents so that the correct causes are determined and the necessary preventive action taken.
10. The collaboration with the medical department on occupational disease, sanitation and related problems.
11. The collaboration with the engineering and purchasing departments in reviewing plans and specifications with regard to safety.
12. That job procedures are reviewed to ensure that the job is correctly done: so that the inherent hazards in the job is clearly defined; and that the proper corrective methods be incorporated in the job.
13. That adequate plant safety inspection is inaugurated and maintained.
14. That the person placed in charge of the accident prevention programme should fulfill a staff function. That he should be given the authority to stop production or an operation *only* in those cases involving an immediate hazard, where it is not possible nor practicable for him to handle the situation through the usual channels of the foreman or supervisor in the department concerned.

This can be achieved in many ways both on a regional and local basis. If local responsibility is accepted the method of the safety engineer or the safety committee can be adopted to suit the circumstances of each case.

An inherent organisational difficulty is the problem of maintaining continuous interest — the elimination of human suffering, through the creation of safe working conditions, should be sufficient incentive for men to work consistently to this end at all levels of management; but this long term objective sometimes becomes a little blurred; and it will be the duty of management to also devise short term programmes that will maintain interest in the whole programme.

Poster campaigns, safety slogans and the skilful use of colour to indicate danger areas and machine parts are effective means of creating and maintaining "safety consciousness" among workers and staff.

These methods of creating a high level of safety consciousness require little more than personal enthusiasm and initiative on the part of top level management and they have proved to be highly effective.

In regard to your own particular problems, it would be of advantage to study what is being done by simalar undertakings overseas. From the information available it appears that the B.E.A. are taking advantage of both the regional and local methods of organisation. They have 14 management sections or divisions from which both generation and distribution is controlled. These divisions are supervised by 6 Safety Officers in charge of whom there is a Chief Safety Officer. They are all engineers (university graduates or members of the institute.)

In your case I have noticed that you are already aware of the problem of accident prevention by the existence of your Safety Precautions Committee.

I am also aware that some of your members have already formed local safety committees to consider their own particular programmes. I am also pleased to be able to state that they are already making use of some of the facilities of the National Occupational Safety Association. We are staffed with engineers so that we can assist the country in its attack upon this very challenging world problem that if left undisturbed would unnecessarily deplete the country of a substantial portion of it's manpower in ever increasing scale as time goes by.

I would like to suggest to you today that you resolve to commence a planned programme of organized accident prevention and to make this resolution effective

form a liaison committee to work with my national organization to create the best means of doing this.

This is a sphere of action in which there is much to be done, and where the highest ethical ideals and values can be brought into play in the development of South African industry. In so doing, greater satisfaction can be derived by men at all levels in industry, from the knowledge that in this work, they are co-operating effectively in building a safer and healthier way of life for their own and for future generations in our industrial society.

PRESIDENT: It gives me great pleasure on behalf of our organization to thank you for this very instructive lecture. Unfortunately only one-third of us have this paper before us, which makes it rather difficult for us to comment on this paper intelligently.

If there are any comments to make at this stage, you are welcome to do so. No comments? Thank you very much once more, Dr. Berliner.

We will now carry on with our reports from the sub-committees which have been standing over since Monday. I think we well be a bit rushed to-morrow morning—I know you all would like to leave early. We will now take the Representations Committee on which Mr. Fraser will report.

REPRESENTATIONS COMMITTEE

Mr. J. C. FRASER (Johannesburg): Mr. President, Gentlemen: For some considerable time your Executive has been considering the question of registering commercial delegates who attend our annual conferences and at the last Convention the Executive Council approved of the formation of a Representation Sub-Committee consisting of Messrs. J. C. Downey, D. J. Hugo, J. L. van der Walt and J. C. Fraser.

One of the Sub-Committee's functions was to investigate the possibility of giving official recognition to the commercial delegates that attended the Association's annual conventions.

A meeting of the commercial representatives and the Sub-Committee was held in Johannesburg on the 28th January when agreement on certain points was reached.

A further meeting was held on the 3rd February by the commercial representatives with their own delegates, after which their recommendations were conveyed to me through two of their delegates, Messrs. Johnston and Nethersole. The minutes of both these meetings are attached to this report.

Mr. J. C. Downey was unable to attend the meeting and the Sub-Committee took the advantage of Mr. C. G. Downie's presence in Johannesburg to co-opt him for this meeting.

The Sub-Committee was unable to meet again and is therefore unable to place a definite recommendation before the Executive, but since the present Convention has been sitting, your Executive has again fully discussed the whole matter and has arrived at a definite decision.

As you all know, the delegates that attend our Annual Conference are as follows:—

> Municipal Council Members; Engineering Members; Honorary Members, Associates, Trade Representatives and Ladies.

This matter concerns more particularly the Trade Representatives. These delegates attend our Conferences and the number is increasing every year and our financial commitments are also increasing every year.

During the last few years the number of delegates attending our Conferences varied between 240 and 360. Our annual revenue is derived wholly from the subscriptions levied on the municipalities and brings us just over £1,000 a year. Trade delegates have been attending our Conferences for a number of years and we would not like it to be otherwise. We feel that the Convention as a whole benefits by the Trade delegates being allowed to attend, but the time has arrived where some sort of control has to be exercised.

As stated in my report, the Sub-Committee met representatives of the Trade delegates on two separate occasions and discussed the matter over a table. There are at least two delegates who were pre-

sent with us at those meetings attending this Conference today.

We took as a basis for our discussion what is done in Great Britain by the British Electrical Power Convention which is run on similar lines to this Convention. The British Electrical Power Convention, however, invite representatives from a number of commercial organizations, the organization paying a registration fee plus an individual delegate attendance fee and I think they limit the number of delegates to two per Association.

The commercial representatives attending our Sub-Committee have pointed out, however, that this method is not acceptable to them and they wish to have the right for each individual firm to be registered, but the Association to stipulate the number of delegates attending from each firm. Obviously the number of delegates who will attend is to be controlled otherwise we shall not be able to find a hall big enough to accommodate us.

Today I want to ask this Convention to give your Executive permission to alter the Constitution so that commercial or trade delegates can be registered as members of our future Conventions on paying registration fees. The commercial or trade delegates will not interfere in any of the Association's domestic matters or take part in any discussions unless approved of by the President. In fact, the commercial or trade delegates do not want to interfere in any way but there may be occasions when they would like to take part in discussions particularly where it affects Government legislation or specialized machinery, in which case it would be advisable for the President to exercise his authority in allowing discussions to take place.

I have briefly outlined the work of your Sub-Committee and the decision of your Executive, and in order to legalize this matter it is necessary to alter our Constitution and the following should be suitably placed in our Constitution:—

> "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 Fee — £10.10.0 per Company.
> Representatives — £3.0.0 per representative plus £1.0.0 per accompanying lady.
>
> The President may accord the courtesy of debate to any visitor or Company representative."

These alterations to the Constitution must be authorised by the full Convention aund I would like you to endorse the action of your Executive and give them full authority to amend the Constitution. Thank you.

PRESIDENT: Thank you very much Mr. Fraser for this comprehensive report and the work put in by the Committee members — we appreciate it very much.

This is a matter of great importance to our friends in the trade and I would appreciate as full a discussion as possible. Trade visitors, you are very welcome to take part in this discussion. The matter is now open for discussion.

Mr. J. BERRY (African Cables Ltd.): Mr. President and gentlemen: I am afraid I have no authority to speak for trade representatives on this matter; but, as I was invited to attend the meeting in Johannesburg when this subject was discussed and as I have attended a British Electrical Power Convention, as a delegate of an Association which is a Member of that Convention, I would like to make some comment. As I say, I have no authority to speak for the trade representatives present but I am sure they will agree with me when I say it is their wish to attend your Convention, which attendance is regarded as a privilege. But, while appreciating this privilege, there is a feeling of diffidence because we are unable to make our contribution to the expense which these Conventions incur. Furthermore there is the point to which Mr. Fraser referred: there will, on occasion, be discussion on subjects to which trade representatives

could make useful contributions. Because of my experience of the British Electrical Power Convention, I am in favour of a scheme whereby you would have a Convention as an organization separate from the Association of Municipal Electricity Undertakings but members of the Association of Municipal Electricity Undertakings would automatically be members of the Convention. Trade membership would be granted to trade associations on whom would be placed the responsibility for the number and personnel of the individuals attending. Subscriptions for member associations and persons attending the Convention would be fixed to suit the financial requirements.

I do hope, Mr. President, your members will have no doubts at all in accepting this proposal by Mr. Fraser and I can assure you that trade representatives have no desire or intention to take part in or influence any of your domestic affairs.

PRESIDENT: This matter has to be thrashed out — here is considerable food for thought.

Mr. J. E. MITCHELL (Salisbury): I would like to second the proposal made by Mr. Fraser.

Mr. P. L. VERGOTTINI (Brakpan): Mr. President, if the Association of Municipal Electricity Undertakings of Southern Africa admits as members the representatives and/or directors of engineering firms and selling organizations then I feel our Association would lose its identity as an Association of Municipal Electricity Undertakings thereby creating an excuse for some municipalities that are against the many conferences held at present to withdraw their council members.

At every Convention the representatives and/or directors referred to above are present affording an opportunity for municipal electrical engineers to meet them and to discuss individual problems. If these men are now admitted as Members then the only difference it will make to an existing practice is that they will pay a subscription and have the right to take part in discussions.

I would be pleased if you would allow this matter to stand over so that we can think about it and then discuss it finally next year.

Mr. P. C. ASSELBERGS (Ermelo): I think this is the third time that such an item of vital importance with regard to the amendment of the Constitution is just sprung on us. I think we should have more time to think these matters over and suggest that you leave this matter over until next year. You could discuss it now, but I do not think a decision should be taken just now.

Mr. J. C. FRASER (Johannesburg): I would like members to appreciate the amount of work that has been put in by the Sub-Committee and the Executive on this very important matter, and, as we only meet as a Convention once a year, there is no advantage in delaying it for a further year.

A great deal of work of the Sub-Committee and Executive is done by correspondence and it is very difficult for them to make much headway until the Convention sits. I would ask you to think this matter over very carefully and having done so give your Executive full power to amend our Constitution and finalize our discussions with the commercial organizations.

Mr. P. C. ASSELBERGS (Ermelo): Mr. President this is not a motion of no confidence in the Executive, we have every confidence in the Executive, it is just that a decision must be taken at such short notice.

PRESIDENT: I would be very pleased if you would discuss this matter very fully now — a year is a long time to leave this matter over. Discuss it by all means, we do not want to rush you, but would be pleased if a decision could be arrived at at this Convention.

Mr. P. L. VERGOTTINI (Brakpan): Mr. President, on your invitation to express an opinion I gave my views on this subject. If that is not in line with the views of the Executive then it is just too bad. However, should these representatives and/or directors become members we should draw up terms of reference so as to define the activities of council members, engineer members and other members.

In view of all that has been said, I am still of opinion that more time should be allowed in which to consider the matter before coming to a decision.

Mr. J. C. DOWNEY (Springs): There appears to be some misunderstanding and our members may be a little bit perturbed that commercial representatives are to become members of the Association of Municipal Electricity Undertakings. They will not become members of the A.M.E.U. the same as engineers and councillors. Our commercial friends feel they would like to contribute something to our expenses, and we are only giving them the opportunity to do so, in the form of a Convention registration fee and representatives fees. They will only be contributing to some of the expenses of Conventions. (*Applause*).

ADJOURNED FOR TEA

PRESIDENT: We now continue the business of the Convention. We are still busy discussing the subject of Mr. Fraser's proposal. It would be very much appreciated if Council Members would let us have their views as this is a matter of great importance.

Mr. V. E. O. BARRATT (Queenstown): Mr. President, I feel that the character of this Convention might be changed for the worse should these representatives not have access to our Convention. If we perhaps have representatives of large Engineering firms as members of this Convention, we will gain valuable information from them, and I would like to support the proposal of Mr. Fraser for the amendment of the constitution.

Mr. H. R. W. M. BÄHR (Ventersdorp): In support of Mr. Fraser's proposal, I would like to say he can compare our Conference with a golf club. Playing members and social members! (*Laughter*).

Cr. E. J. SMITH (Standerton): Mnr. President, ek wil mnr. Fraser ondersteun vir die rede dat ek voel dat hierdie verteenwoordigers ook hulle deeltjie kan bydra tot die koste van Konvensies.

Deur die bydrae van besigheidsverteenwoordigers kan dit miskien moontlik word dat in die toekoms ook kongresse gehou word op kleiner dorpe wat nie die koste van sulke kongresse kan dra nie.

Mr. H. J. GRIPPER (Port Elizabeth): Mr. President, I wish to support the Executive Council in their proposals on this matter but, as I stated yesterday, there are other matters related to the constitution which I would like the Executive to place before the Members for their viewpoints. This association is not a select body of individuals intent upon gaining their own ends but a body formed in the best interests of all Undertakings and *their consumers*.

I regret however, the suggestion which has come from the platform, that it is only the Executive Council who work throughout the year on these matters. We do appreciate the work done by the Council but I must, in self defence add that I personally do a great deal of thinking throughout the year on the problems which arise and I feel sure that many other Members do likewise.

I have been persuaded by the Executive in this instance not to press this matter at this stage and accordingly I support Mr. Fraser's proposal wholeheartedly, though I hope that the matter will be carried further on a future occasion.

ON MR. FRASER'S PROPOSAL BEING PUT TO THE VOTE IT WAS UNANIMOUSLY AGREED TO.

PRESIDENT: We shall now continue with the reports from our sub-committees —the next is the report from Mr. J. L. van der Walt of Krugersdorp on the METER TESTING CODE.

Mr. J. L. VAN DER WALT: Mr. President, it will be remembered that your association agreed upon the Meter Testing Code being promulgated on condition that no further charges be levied against Municipal Undertakings, except the annual licence fees for authorized testing stations, i.e.

£30	0	0	for Class A stations.
£22	10	0	for Class B stations.
£15	0	0	for Class C stations.

The Electricity Control Board who will administer this code, accepted this condition subject to the approval of the Minister of Economic Affairs. The whole matter has now been referred to the Minister and the result of his investigation is awaited.

PRESIDENT: Are there any comments?

Mr. P. F. W. HALL (Somerset West): As you know I am definitely opposed to the Government's testing of domestic meters, but consider meters of the M.D. type only should be tested under Government supervision since the amounts involved are of appreciable sums.

PRESIDENT: The next report is from Mr. J. C. Downey of Springs on the WIRING REGULATIONS COMMITTEE.

Mr. J. C. DOWNEY: I know many of you have been waiting for information for some time. As you know, originally it was intended to embark on group promulgation of the regulations in a similar manner in which the first edition was promulgated. Firstly we ran into a little trouble about the translation but this was approved, and finally the S.A.I.E.E. approved the English and Afrikaans versions. The next step was to proceed with the promulgation of these regulations, which looked very easy at the start. It was found, however, that in the Transvaal, group promulgation would not be entertained and in addition certain clauses relative to Specifications of the British Standard Institute would prohibit the promulgation in their present form. Investigations proceeded and we were advised by the legal people that this would not be acceptable unless they were rewritten by a legal man. We carried on this investigation for some time and it was found that certain further clauses would have to be removed if promulgation of these regulations were to be undertaken. We still continued with our investigations and it was found that the only way to adopt the regulations would be to accept them as a code of practice under Section 19 (1) of the Act which reads :—

"No person shall in any area in respect of which a determination has been made under section eighteen, connect any wire, fitting or apparatus in respect of which wiring work has been done with a source of supply of electricity controlled by a supplier, unless such wire, fitting or apparatus has been inspected, tested and approved by a person in the employ of and nominated for the purposes by the supplier, and permission to make such connection has been given by the supplier."

The legal advisers now tell us that we can apply these regulations by getting the Council to approve of them as regulations of the Council and in this respect Johannesburg has done quite a lot in this matter. Johannesburg has adopted this scheme.

Before I ask Mr. Fraser to give you some of his experiences in this matter, I wish to advise that the adoption of the regulations as a code of practice does not permit you to prosecute for any breach of the regulations.

I shall be grateful if Mr. Fraser will now give you some of his operating experience under the new set up.

Mr. J. C. FRASER (Johannesburg): I think Mr. Downey has covered most of the points. There is very little to which I can add except probably to tell you what advice we got from our legal people in Johannesburg.

"PROCEDURE ADOPTED BY JOHANNESBURG IN ENFORCING THE STANDARD WIRING REGULATIONS (2nd EDITION)

1. *Difficulties of Group Promulgation*:

The principal legal difficulties which lay in the way of attempting the above as with the first edition, arose from the fact that there are many references in the Standard Regulations to both British and South African Standard Specifications. In so far as the South African Standard may have been referred to in say, a Government notice promulgating it, they will already enjoy the force of law in South Africa and might be quoted merely by reference. However, all of the British Standards and a large number of South

African have not been promulgated and therefore contain no force in law if referred to. The solution to this would be the almost impossible task of detailing them as schedules in the promulgation of the Standard Wiring Regulations. This in turn would raise embarrassing difficulties as any specifications were from time to time superseded by amended specifications.

Additional to the above, the Transvaal Province exhibited a growing unwillingness to permit a joint promulgation leading to even greater complication should each town individually have to promulgate the Standard Wiring Regulations and schedules.

2. *The Standard Wiring Regulations as a "Code of Practice."*

In view of the foregoing difficulties, Johannesburg adopted the view that it would be legitimate to look upon the Standard Wiring Regulations mainly as a "Code of Practice" to be adopted by the wiring contractors working in its area of supply. This view was re-enforced on referring to the enabling powers with which the supply authority is endowed by Section 19 (i) of the Electrical Wiremen and Contractors Act No. 20 of 1939, viz.: The Act prohibits the connection with a source of supply controlled by the Council unless the fittings, etc., have been inspected, tested and approved by a person in the employ of and nominated for the purpose by the Council and unless permission to make connection has been given by the Council. Since the powers of approval are not restricted it seems sufficient for the Council's purposes, if the person inspecting and approving were to do so with due regard to the Standard Regulations as amended from time to time.

This procedure would permit the Regulations to be a guide "Code of Practice" and greater flexibility in administration would be obtained as it obviates the necessity of amending By-laws by lengthy process if any changes become necessary.

The essence of this procedure is to inform all the wiring contractors concerned that this was to be the situation supplementary to the Council's normal By-laws covering electricity supply in its less purely technical aspects. Johannesburg has done this firstly by inserting in both official languages in the local newspapers an advertisement and this was followed up by a roneoed letter quoting this advertisement to every contractor registered in Johannesburg.

3. *Additional Procedures in Johannesburg.*

In response to many approaches from electrical contractors regarding interpretations and rulings arising from the By-laws and Standard Wiring Regulations, Johannesburg has also adopted a procedure of issuing circulars to all registered contractors as and when necessary.

These all constitute a "Code of Practice" indicating to contractors what methods, procedures, interpretations, etc., Johannesburg's Installation Inspectors will abide by in operating in terms of Section 19(i) of Act No. 20 of 1939.

4. *Comments.*

The whole of the foregoing procedure has been adopted with great smoothness and has generally been welcomed by the wiring contractors. Thus far the occasion of a TEST CASE in court of law challenging the validity of this procedure has not arisen.

Mr. W. H. MILTON (ESCOM): It seems to me that the important aspect of this problem is covered by the Wiremen and Contractor's Act in terms of which the supply Authority has every right to take legal action against anyone who connects to the system an installation which does not comply with the requirements of that Authority. In terms of the Act the supply Authority is called upon to inspect and approve the wiring work before it is connected to the supply Authority's system. This of course only applies in an area determined in accordance with the Act.

Mr. H. J. Gripper (Port Elizabeth): Mr. President, I was very pleased to hear the proposal of the Johannesburg Undertaking and consider this a very excellent way of applying the Standard Wiring Regulations. To apply these Regulations

as a Code of Practice meets the position very well as, in my opinion, these Regulations are far too specific in their nature to be incorporated as by-laws.

Here again I trust that this Association of Municipal Electricity Undertakings will be in a position to co-ordinate this matter and help in the formulation of a Standard set of by-laws. To emphasize my point concerning detailed regulations I would like to refer Members to an article which appeared in the *Electrical Times* dated 24th December, 1953, by Mr. H. W. Swann, ex-Inspector of Factories in Britain. This article is well covered too by an editorial paragraph in the same edition which I would like to read to Members with your permission Mr. President:

"Any factory electrical installation of 1908 would seem a very strange sight today; yet as the article by Mr. H. W. Swann on a later page reminds us, today's fluorescent lighting installations and electronic control equipment are subject to the same set of regulations that governed the cruder wiring systems and relatively few motors of the Edwardian era. That this is so is a remarkable tribute to those who framed the original code of regulations, and kept sufficiently close to fundamental principles to enable advances undreamed of in the first decade of this century to be embraced without the need for modification. Yet even to point this out is to give a reminder that one day, the regulations will inevitably require revision. The growing use of electronics in factories, which so modifies the concept of earthing may be the occasion for this, or perhaps some technical advance will render inappropriate the wide-sweeping exemptions which at present precede the regulations proper. However this may be, when the time for revision comes, there will be a hard decision to be taken. Shall the present flexibility and broadness be retained, or shall a more closely tailored code narrowly defining approved practice be substituted?"

Mr. J .C. FRASER (Johannesburg): I was asked just to make it perfectly clear that Johannesburg is now operating on the Second Edition of the Standard Wiring Regulations and we have been operating on that edition for a considerable time.

ADJOURNED

FRIDAY—14th May, 1954:

9.30 A.M.

PRESIDENT: Good-morning gentlemen: We shall now continue with the reports of the sub-committees. Mr. J .C. Downey of Springs will report on the Wiring Regulations Committee.

Mr. J. C. DOWNEY (Springs): I have two questions which I cannot answer. Would Mr. Fraser kindly give us the answers to these two questions. Firstly, the wiring regulations under which the licenses are granted and secondly, does the Board endorse the licences to say that the wiremen must carry out their work in accordance with the Boards regulations.

Mr. J. C. FRASER (Johannesburg):

(a) The Wiring Board has notified all candidates that they will be examined on the 2nd Edition of the Standard Wiring Regulations.

(b) The Board has no power to enforce wiremen to use the 1st or the 2nd Edition of Standard Wiring Regulations, that is a matter for the local Supply Authority to decide themselves.

Mr. W. G. THACKWRAY (Kokstad): We then have to have the 2nd Edition promulgated and the First Edition repealed ?

PRESIDENT: Mr. Thackwray I think Mr. Fraser has just tried to explain that if you wish to operate on the second edition, you will have to have it promulgated. On the same lines as for the first edition and in the end it is proved impossible in the Transvaal.

Mr. W. H. MILTON (ESCOM): I do not know whether Municipalities are in a position to adopt a procedure similar to that of the Electricity Supply Commission. One of the conditions of supply which is incorporated in the Commission's licences in respect of each of its undertakings is

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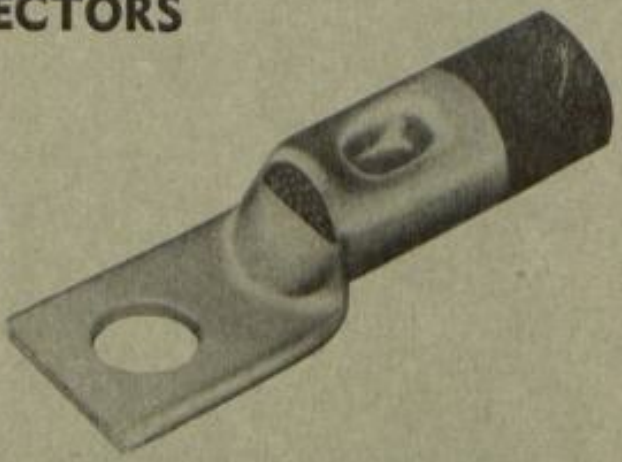

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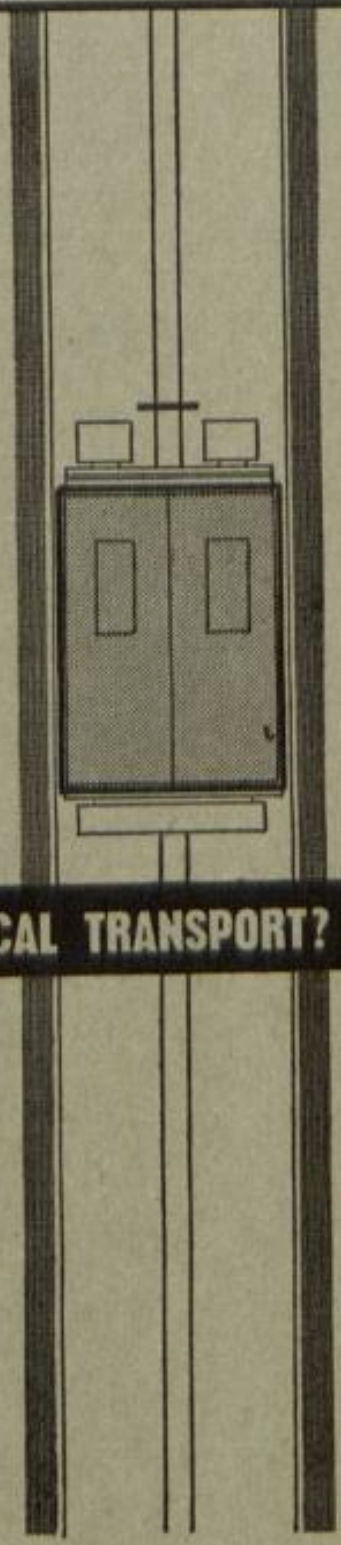

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that "the wiring of the consumer's premises shall be carried out in accordance with the standard regulations of the South African Institute of Electrical Engineers (Incorporated) as in force or amended from time to time, for the wiring of premises." This means that the amended wiring regulations are now of full force and effect having been adopted by the Institute. Our inspection of installations is carried out on the basis of those wiring regulations and approved if the installation complies. In other words we are now in a position to insist that the wiring work must be carried out in accordance with the amended regulations. I do not know whether a similar approach is possible for the Municipalities, that is, that the requirements for complying with the wiring regulations may be made a condition of supply and therefore the condition will form part of the contract entered into by each consumer when making application for supply of electricity.

Mr. J. L. VAN DER WALT (Krugersdorp): It is not quite clear what the legal differences are in promulgating these standard wiring regulations. From what I understand, references were made to the S.A. Bureau of Standards.

Is it not possible to clear that difficulty by deleting these references from the regulations to be promulgated?

Mr. J. C. DOWNEY (Springs): The Government Legal Adviser has advised us that many clauses are not good in law. Even the standard regulations in the second edition which are similar in many ways to the first edition have many references to British Standard Specifications.

That is not the only problem. There are other problems such as the words "standard", „approval", etc., which make by-laws extremely difficult for promulgation and would have to be eliminated if they are to be adopted as by-laws.

Mr. W. H. MILTON (Escom): You will probably recall that it fell to my lot to see the Provincial Administration at Pretoria as a member of the Sub-Comittee of the Association and later individually to interview the Provincial Administration in Cape Town where the approval of the Afrikaans version was also involved. For the purpose of gazetting the regulations which, in the Cape Province, are published in full by the Provincial Administration, arrangements were to be made for the availability of the type set up for use by other Provincial Administration publications. It was drawn to our attention at that time that the Provincial Administrations did not accept responsibility for determining that the proposed regulations were good in law. We were also advised that it was not possible to "regulate by quotation" which meant that it was not possible to quote regulations prepared by some other body unless the quotation were verbatim if those regulations are to have any effect in law. It was for that reason that the regulations appeared in the Gazette in full and provision was made in certain Provinces for a schedule of Municipal Authorities to be appended to the regulations so that they would be in full force in those Municipal areas quoted. It was agreed that it was possible to add to or delete from the schedule the names of Municipalities from time to time without the necessity of reprinting the regulations themselves.

Mr. J. C. DOWNEY (Springs): I must apologize for what seems to have developed into a discussion between Mr. Milton and myself. He is quite correct in everything he has said, but the Transvaal Provincial Administration today will not, if they can possibly avoid it, promulgate any by-laws that are not sound in law.

SAFETY PRECAUTIONS COMMITTEE (WIRING REGULATIONS)

J. C. Fraser (Johannesburg)

At the A.M.E.U. Executive meeting on the 18th November last it was resolved that the procedure adopted by Johannesburg in regard to the Standard Wiring Regulations would be circularised to members of the A.M.E.U. Executive and this has now been done. Johannesburg has adopted the view that it would be legitimate to look upon the Standard Wiring Regulations mainly as a Code of Practice to be adopted by wiring contrac-

tors working in its area of supply. This view is reinforced by the enabling powers endowed by Section 19 (1) of the Electrical Wiremen and Contractors Act No. 20 of 1939, viz.:—

The Act prohibits the connection with a source of supply controlled by the Council unless the fittings, etc., have been inspected, tested and approved by a person in the employ of and nominated for the purpose by the Council and unless permission to make connection has been given by the Council. Since the powers of approval are not restricted it seems sufficient for the Council's purposes if the person inspecting and approving were to do so with due regard to the Standard Regulations as amended from time to time.

This procedure would permit the Regulations to be a guide "Code of Practice" and greater flexibility in administration would be obtained as it obviates the necessity of amending By-Laws by lengthy process if any changes become necessary.

PRESIDENT: The next report is the SAFETY PRECAUTIONS COMMITTEE.

Mr. J. C. DOWNEY (Springs): The Safety Precautions Committee last year considered amendments to the second edition. These amendments will be handed to the Secretary and will be circularized to all members in due course.

PRESIDENT: The next report is that of the TARIFFS SURVEY COMMITTEE.

Mr. J. L. VAN DER WALT (Krugersdorp): As a result of Mr. Pulik's paper on tariffs during the Convention at Johannesburg, your Executive appointed a Tariff Survey Committee. This Committee agreed that a survey of electricity tariffs of the country will serve a very useful purpose to all members.

In the near future a circular letter will be addressed to all members by the Secretary, requesting that a complete set of tariffs be forwarded to myself. These will be tabulated for future reference. The Committee has also decided that a survey of domestic tariffs will be undertaken first, so as to determine the effect of various forms of tariffs on the consumer's account, in relation to his consumption and to establish average usage of electricity by consumers.

Johannesburg and Krugersdorp have undertaken to do a preliminary investigation with the object of gaining experience before requesting other members to submit data.

I may report that this sample survey is progressing well.

The sub-committee consists of the following:—

Myself (as convener)
Mr. C. G. Downie (Cape Town)
Mr. A. R. Sibson (Bulawayo)
Mr. J. C. Downey (Springs).

I have also been asked to mention that the Tariff Survey Committee is not only investigating electricity consumption tariffs. We would like you to include all your tariffs, e.g. service charges, connection fees, etc.

PRESIDENT: We thank you — the report is accepted. The next is the report of Recommendations Committee for New Electrical Commodities.

REPORT OF RECOMMENDATIONS COMMITTEE FOR NEW ELECTRICAL COMMODITIES

D. J. Hugo (Pretoria)

The Standard Regulations for the Wiring of Premises provide, that wiring, fittings and accessories, intended for use in accordance with the regulations, shall comply with a South African specification, published by the Standards Council, or, if no South African Specification exists, then with the latest revision of the appropriate British Standard Specification.

The Recommendations Committee confines its activities to the consideration of commodities, intended for use in the Wiring of Premises, which are not covered by either a South African of British Specification.

It is necessary to make this clear, for the reason that, judging by the large number of applications received, the Committee is mistakenly regarded as an easy means of obtaining approval of commodities, without proving compliance with the requirements of the Wiring Regulations.

Some 20 applications for the approval of commodities, intended for use in the Wiring of Premises, have been received since the last Convention. These were considered at a meeting of the Recommendations Committee held on the 4th March last.

It was found that in all but two instances a standard specification was available and the applicants were accordingly asked to prove compliance with the relative specification.

One decision taken by the Committee may be of general interest. It relates to the type of switch for use as main and sub-main switches. The Committee has decided to recommend to members that switches, intended for use as main and sub-main switches, should comply with the requirements of the South African Standards Specification 152-1951.

This specification provides for two types of switches, namely, Class A and Class B, which are required to withstand a test voltage across the break, with the switch open, of 4,000 volts and 2,000 volts, respectively.

Class A switches are recommended for acceptance as main switches and Class B as sub-switches.

The Committee has also decided on the procedure which should be adopted when making representations for the approval of a particular commodity.

Applications should be made to the Secretary in the first instance. The Secretary will then request the applicant to submit a sample of the commodity to the Bureau of Standards and the Bureau will advise the Secretary whether the commodity is covered either by a South African or British Specification. In such event, the applicant will be required to furnish a test report from the Bureau on tests conducted in accordance with the requirements of the relative specification.

In the event of there being no standard specification against which the commodity can be tested, the applicant will be required to submit a test report on tests as may be prescribed by the Committee.

In all cases the applicant wil be required to bear the cost of testing.

PRESIDENT: No discussions — then we accept Mr. Hugo's report with thanks.

Mr. J. C. FRASER (Johannesburg):

LOCAL GOVERNMENT COMMISSION OF ENQUIRY

J. C. Fraser (Johannesburg)

Transvaal members of the Association will remember that early in 1953 the Administrator and Executive Committee appointed a Commission on Enquiry into the Local Government System operating in the Transvaal.

The Commission has issued a number of questionnaires to individuals and organisations other than local authorities and in the case of your Association the questionnaire was submitted to the Electrical Engineers and Transvaal members of the Executive Council.

The Electrical Engineers had a number of meetings at which a suggested memorandum was fully discussed and the final draft thereof was submitted to the Transvaal members, i.e., Councillors, for approval. When this had been obtained the memorandum was forwarded to the Secretary for transmission to the Commission of Enquiry.

A copy of the memorandum is embodied in the records of the Association, and will no doubt be available should members require to scrutinise same.

PROPOSED AMENDMENTS TO RULES AND CONSTITUTION

Mr. G. J. MULLER (Bloemfontein) (Convenor of the Sub-Committee):

We have received the following proposals from Mr. H. J. Gripper of Port Elizabeth:—

"That in the opinion of this Convention the following Clause be added to the Rules and Constitution after Clause (d) of the OBJECTS of the Association, viz.:

(e) To guide and assist Municipal Electricity Undertakings in their efforts to provide cheap and abundant supplies of electricity wherever required by Consumers situated within the areas of jurisdiction of such Undertakings and to promote uniformity and equity

in the conditions under which such supplies are provided."

That implies quite a wide service. As soon as the Organization can consider advisory service, the Executive will give it due consideration. They also feel that (e) as suggested could very well be read into (a) under the heading of "Objects" which reads: . . . . "To promote the interests of Municipal Electricity Undertakings."

I would like this Convention to give some guidance. As no other material suggestions have been received and as the matter is already a year old, will the Convention authorize the Executive to conclude this matter with the guidance of the sub-committees ?

Do you agree that the Executive try to finalize the amendment of the Constitution —Copies were apparently not received by members. Three months could be allowed for comments.

Mr. C. R. HALLE (Pietermaritzburg): I think these things have to be settled at a Convention. Just to leave it to the Executive will be irregular. Should it not be put on the Agenda as a "Notice of Motion"?

PRESIDENT: The Convention decided that the Executive will consider the matter in any case.

Gentlemen, I must apologize that the Mayor will not be able to attend the closing of our Convention. The Deputy-Mayor is also busy at the moment, but he hopes that he will be able to attend.

Mr. MILTON (Escom): Mr. Asselbergs of Ermelo asked me to make a recommendation in regard to the discussion in the Engineer's Forum. The questions discussed should be reported in the Proceedings in full. Last year only a resumé was given, although the discussions provided very valuable reference data.

Mr. V. E. O. BARRATT (Queenstown): There are several things that have prompted me to overcome my reticence and to talk to so large a crowd of people. Starting with the fact that during the last few years we have found it so difficult to obtain staff — not only skilled staff — but even apprentices and learner-shiftsmen — spurred on by the pleas of an eager young boy, by the confidences of a worried parent, by your Address, Sir, and by the Valedictory Address given by Mr. Fraser, the position in the small towns is that it is almost impossible to fill junior vacancies and, on investigation, I have found that the reason appears to be that so many of our Undertakings are offering minimum wages for apprentices and learner-shiftsmen. There is no standard rate of pay laid down for positions like learner-shiftsmen, and, since the War, the starting wages offered by Commerce in general, have been far in excess of those offered by Electricity Undertakings, hence little new blood has been brought in to strengthen the labour stream. Now, Sir, I suggest that the remedy lies in every Undertaking, large or small — no matter how small — making it its aim to tra'n extra personnel. I have found that I have been able to fill junior positions that have remained vacant for a long time, by increasing the starting rate, so that the remuneration compares with that offered by, say, the Post Office. I have seen to it that an extra £10 per month, necessary to start a lad on his way in a useful post, has been obtained. One parent was particularly keen on his son starting his apprenticeship with us as an Electrician, but just could not afford to let him do so. He had in fact, to enter his son in some employment elsewhere where the starting rate of pay was so very much higher than what we were offering. I urge you all, on returning home, to make a special endeavour to obtain funds that will enable you to offer starting wages that will entice young men to enter the services of the Electricity Undertakings of South Africa. Go to it—do it—I know you can.

Mr. D. HAIG-SMITH (Middelburg, C.P.): I fully agree with what Mr. Barratt has just said, we find it extremely difficult to replace staff in the smaller towns and to get apprentices. Apart from the salaries, it is impossible to attract staff to the small towns even if salaries are comparable, due to the facilities offered by the larger towns. I would appeal to all Engineers to do a bit of propaganda work amongst acquaintances, and friends. I

think a little propaganda work amongst our friends with a view to increasing the flow of apprentices in future, will probably be of great assistance.

PRESIDENT: It falls to me to thank you on behalf of Bloemfontein for the way in which you have accepted our hospitality. It was indeed a pleasure to have you as our guests.

„Ons wens u almal 'n aangename reis terug na u huise toe en vertrou volgende jaar in Pretoria, dat u weer in volle mag daar in die werk sal spring."

I will now call upon Councillor Acton to propose a vote of thanks.

Cr. C. E. ACTON (Pretoria): Mr. President, Ladies and Gentlemen: I think in the first place I should of my own volition say that I have been selected for this important job, normally undertaken by a Councillor, because I was the only Councillor present when the selection was made. I must say I find myself in a difficult position in expressing, on behalf of this Conference, our thanks. I find that words will be inadequate to meet the measure of your hospitality, in which I think we must be impressed by the example set by Bloemfontein, in respect of the obvious co-operation between the Council and the Engineers.

One cannot help noticing the fact — I believe that in a recent breakdown your Mayor went on the job himself, and I feel that is adequate illustration of the point I am trying to make.

On the other hand, Mr. President, I think when we refer to that co-operation, it is only logical from a business point of view, that it should be so because I suggest that if Municipalities invest millions in Power Stations, it is common sense that they should find adequate representation to the clearing house — this Conference, to see what is happening — what progress is being made technically and to keep apace on the economics of their undertakings.

Then, Sir, I feel that they do the logical thing here, and that we may possibly with a little remedy bring more co-operation to these valued Conferences on the part of Councillors in the manner that your City has demonstrated. I would propose that possibly we put as an item on the agenda the suggestion that steps be taken to limit the amount that may be taken from electricity profits, in relief of rates — that will ensure a good attendance of Councillors. I even venture to suggest under such circumstances that certain of the Councillors may be accompanied by representative ratepayers.

PRESIDENT: Councillor Acton, may I please interrupt? The Deputy-Mayor has just arrived and I would like him to hear what you have to say, do you mind waiting just a few minutes before you continue?

Mr. President, Mr. Deputy-Mayor, Gentlemen: I was dealing with the question of transfer of profits from Electricity, in relief of rates, but in case you should already have any misgivings on the point, I want to assure you that I was speaking in jocular vein.

Mr. Chairman, what rather struck me was the self-effacement of your Worthy Mayor of Bloemfontein — when he made his promises to entertain us in a certain way. I thought he overdid the invitation but he has done everything as threatened and what we regarded as a bit of a myth as "the Free State welcome" is something worth while. He had something on us there, definitely. The only consolation is this — that we found the simple ingredient and that is a goodwill, which I say, we could with advantage cultivate in all our cities and towns.

Mr. President, I am at a stage when I feel that if I say anything more in recognition of your hospitality, it would be rather superfluous, therefore, let me just state that we will have memories of this visit and we will learn from your technique of entertainment and above all, and apart from all you have done in other directions, I say that you have dispersed kindness and consideration to all concerned.

What more could you do, therefore, if I have been remiss in any way in expressing to you, Sir, your Council and the citizens of your beautiful city, our sincere appreciation please hold me excused. We will take away with us and reflect on the many pleasantries that we have encoun-

tered on this occasion, in the beautiful City of Bloemfontein.

In conclusion I again move a very humble vote of appreciation and thanks for your hospitality and kindness. Thank you. (*Applause*).

Cr. H. P. FRICK (Heidelberg): Mnr. President, Die Onder-Burgemeester, Dames en Here: Dit is vir my 'n aangename voorreg om die mosie van dank te kan sekondeer. Ek wil vir Bloemfontein gelukwens met hierdie pragtige prestasie — hulle het vir ons 'n voorbeeld gestel. Ek voel ek sou my plig versuim tensy ek, namens die Konvensie, melding maak van die voorreg wat ons gehad het om die uitstappie na Mazelspoort te hê. Ons is wel bewus daarvan dat dit heelwat onkoste en heelwat organisasie en las veroorsaak het vir Bloemfontein, nogtans kan ek u verseker dat ons dit ten volle geniet het.

Namens die Konvensie wil ek nogeens vir u hartlik bedank en hierdie mosie van dank sekondeer.

THE DEPUTY-MAYOR (Cr. CHRIS DE WET): Mr. President, Ladies and Gentlemen: I have been asked by the Mayor to apologize for his inability to be here this morning. As you know the Deputy-Mayor is always the stop gap in cases like this, and for this Convention I am the "spare plug" to be used by the Mayor.

We are very glad to have you amongst us and to know that you have enjoyed your short stay in Bloemfontein. The hospitality we have been able to show, is the simple hospitality that you will always find in the Free State, also in Bloemfontein. The little "braaivleis" and "kromhout" helped to make you feel a little happier and we do hope you enjoyed it all. We welcome you all here. We do hope further that your delegates will have a safe and pleasant return journey.

Ladies and Gentlemen, I am very pleased to have had the opportunity of saying a few words, and I can assure you of the sincerity of our appreciation and trust you have all enjoyed yourself in Bloemfontein. (*Applause*).

Mr. J. E. MITCHELL (Salisbury): Mr. President, it is my duty to thank the City Council and ratepayers of Bloemfontein on behalf of the ladies, so that when I address you on their behalf I shall speak as one. In the first place, however, I would like to address the ladies this morning on behalf of all the members of this convention. I find it a bit difficult, in a way, toasting the ladies without a glass in my hand, but firstly may I say that I cannot imagine a convention without the ladies present? Think how drab and dull it would be without them. As my good lady has not been able to attend this convention, I have done the next best thing by wearing my yellow waistcoat, and now I believe the ladies are all going about looking for yellow wool and gold buttons. Also we have been very highly entertained by you ladies in the hotel. If we did not have the ladies present, I would hate to think the trouble we men would have got into, but with your presence, when 10 o'clock came, we quietly proceeded to bed.

Now speaking on behalf of our ladies, I wish to thank Bloemfontein for their hospitality. First of all there was the cocktail party on Teusday evening, and here I noticed a number of the ladies gathered around the Mayoress, Mrs. Fichardt, and judging from the giggles that came from that group, it made me think that probably not all the jokes were parlour ones — I am sure they enjoyed it very much. They are always well looked after — the waiters flock around them and they have a wonderful time. On Wednesday there was the bus tour and tea with the Mayoress on her farm, and it is amusing to recount that while the ladies were discussing cows, the gentlemen at the convention were discussing bulls (laughter). On their return journey, on passing the worthy President's house, the bus driver informed the ladies that they were all invited to lunch (laughter). Then there was the picture taken in the afternoon — these ladies added colour to this picture, and would make the photo appear excellent in technicolour. Then, of course, there was the lovely drive to Mazelspoort for the folk dancing and braaivleis, and there again, watching the ladies, you could see envy in the eyes of the older ones, and

longing in the eyes of the younger ones. We really enjoyed ourselves, and we must really thank the ladies for the lovely display they gave us. Again the ladies were entertained so royally at the home of the Mayoress that they saved their husbands 8/6d. for a lunch.

I would also like to thank, on behalf of the ladies, the ladies who attended to the tea and refreshments here every day. I did not see any ladies here, but I am sure they are behind the scenes and have been responsible for the lovely things to eat. Mr. President, I am very pleased that the Deputy Mayor is present at the moment, as I understand that our worthy President will have to foot the bills. He informs me that the Town Clerk has reminded him that no money was allowed on the estimates for this convention, and therefore it will be deducted from our President's salary at so much per month for a good number of years.

Finally, I don't know whether you ladies know, but Mrs. Sibson is leaving on the *Edinburgh Castle* next week for England. We have arranged for a bouquet of flowers to be sent to her cabin, wishing her a speedy recovery from her illness. (*Applause*).

Cr. CHRIS DE WET (DEPUTY MAYOR): As a member of the Finance Committee, I can assure you we wont let your President down.

PRESIDENT: Thank you very much. There will now be an opportunity for anyone to say a few words.

Mr. L. G. AXE (Johannesburg): Mr. President, The Deputy-Mayor, Ladies and Gentlemen: I have been deputed by your Commercial friends to fulfil two very pleasant duties.

The first is to express our sincere thanks to the Association for the steps they have agreed to take to amend the Constitution and permit us to participate in future Conventions on a more formal basis and to assure you that your confidence in us will not be abused.

The second is to thank Bloemfontein and your Association for the very generous hospitality and many kindnesses we have received during the past week. We look forward to our next meeting and we wish you well. Thank you.

Mr. C. R. HALLE (Pietermaritzburg): I think our President of this Convention deserves a special vote of thinks for everything he has done to make our stay here such a pleasant one. Thank you.

Mr. W. H. MILTON (ESCOM): Mr. President, Mr. Deputy-Mayor, Ladies and Gentlemen: I have been asked by the Chairman of ESCOM and Mr. Harding, our General Manager, to express their regret that they were unable to attend this Convention. On their behalf I can only endorse the vote of thanks that has already been proposed.

Mr. H. J. GRIPPER (Port Elizabeth): Mr. President, I am sure I speak on behalf of all attending this Convention when I ask you to convey to your Staff our thanks and appreciation for all they have done in providing us with information whenever required and a special word of praise is due to the Engineers responsible for the very excellent Public Address System which they have installed in this Hall (in spite of Mr. Mitchell's attempt to sabotage it a few moments ago over there!)

Before sitting down also I would like to mention that Mr. Bradley and I have received a joint note from our Chairman of the Port Elizabeth Electricity Committee, Councillor Alf Markman, in which he repeats his regrets at being unable to attend this Convention and asks us to remember him to all his friends here to-day.

PRESIDENT: I would like to thank the City Council who made it possible for you to hold this Conference here this week and for the support they have given me throughout the week — I would also like to thank the members of the Convention who have taken the instructions from the chair in so kindly a spirit.

The ladies who have kept up the good cheer of the men, also deserve our thanks. My thanks are due particularly to the Municipal staff who have supported me extremely well on this occasion, the Town Clerk's staff and my personal office staff for what they have done.

I hope we will be seeing each other again in the same good spirit in Pretoria next year.

On Monday morning when I woke up it was raining, and it really seemed to me as if it was going to be a very black week, but it now appears that I was making a mountain out of a mole hill. I really enjoyed it.

I would also like to thank you for the confidence you placed in me — thank you — this Convention is now closed.

SOCIAL FUNCTIONS

Not only was the 28th Annual Convention of the Association of Municipal Electricity Undertakings of Southern Africa extremely successful in regard to the work done at the Association's conference, but it was also an outstanding social success thanks to the good people of the City of Bloemfontein.

On Tuesday afternoon, 11th May, delegates and their wives were entertained by the City Council to a delightful cocktail party in the very attractive Clarendon Hall. On Wednesday morning the visiting ladies were taken on a conducted bus tour of the City lasting 2½ hours and entertained to tea at the University Cafe. In the afternoon the official photograph was taken, more tea imbibed at the City Hall whereafter the visitors were transported to the Council's beautiful pleasure resort at Mazelspoort. Towards evening the City Council entertained them to a delicious braaivleis where the Bloemfontein Volkspelers gave a colourful display of Folk Dancing. On Thursday morning the ladies were taken by bus to the impressive residence of the Mayor and Mayoress on their farm, Brandkop, where the Mayoress, Mrs. Fichardt, entertained them by way of a delightful tea party. On Friday morning convention closed on a social note with the assembly for refreshments at the Clarendon Hall and the closing sessions of the Convention.

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