Machine hall excavations for the 1 000 MW power station of the Drakensberg Pumped Storage Scheme

Electricity Supply Commission

Megawatt Park, Maxwell Drive, Sandton

The Minister of
Economic Affairs
House of Parliament
Cape Town

6 April 1978

Sir,

As required by Section 19 of the Electricity Act, 1958, the Commission has the honour to present its fifty-fifth Annual Report and Financial Statements covering its work for the financial year ended 31 December 1977.

Members of Commission and Management

Members of the Electricity Supply Commission

Dr. R. L. Straszacker, *Chairman*

Dr. A. J. du Toit

D. J. Malan

E. Pavitt

H. H. L. Abrahamse

Jan H. Smith

Dr. H. J. J. Reynders

Members of the Management Committee

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Assistant General Manager
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Cape Western
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Natal
H. E. Wohlberg
Pr.Eng., B.Sc.(Eng.)(Stellenbosch)

Rand and Orange Free State
F. J. W. Barnard
Pr.Eng., B.Sc.(Eng.)(Stellenbosch), M.B.L.(UNISA)

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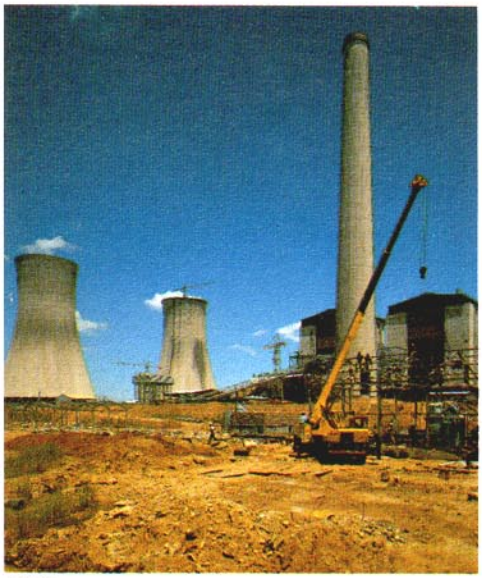

Matla

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Kriel

The year in brief

Electricity supplied

In 1977 Escom's electricity sales increased by 5,9 per cent (9,5 per cent in 1976), from 63 356 to 67 125 million kWh. For the first time in nine years the growth of Escom's electricity sales fell below 9,0 per cent. Whereas the rate of 5,9 per cent is still in excess of the increase in the real gross domestic product for 1977, the effect of the lower economic growth is being experienced by Escom. As the electricity share of the total energy market in South Africa is increasing and as the depressed economic circumstances do not necessarily affect electricity intensive industries, it is expected that the growth in electricity sales will continue to exceed the growth in the real gross domestic product.

The demand on the integrated system reached a peak of 10 735 MW on 12 August 1977, an increase of 6,5 per cent on the maximum demand of 1976. The total sent-out capacity of power stations in commercial service at that date, including the firm capacity of the Cabora Bassa supply, was 12 566 MW, allowing for a reserve margin of 22,3 per cent (13,6 per cent in 1976). The system load factor for 1977 based on the total energy sent out and the maximum demand on the Escom system was 75,8 per cent (76,1 per cent in 1976).

Despite the 5,9 per cent increase in sales, the amount of coal burnt in Escom power stations increased by only 0,7 per cent in 1977 (8,8 per cent in 1976). This was brought about by more energy being obtained from hydro stations; the coal consumption of the high-cost coastal stations could consequently be reduced and greater use was made of the national grid. In this respect, it is significant that rail tariff increases resulted in 1977 in an average increase of R4,71 per ton of Western Cape coal, whereas pithead coal rose by R0,78 per ton.

Revenue, costs and capital expenditure

Against a total revenue of R1 030,6 million, representing an increase of 57 per cent above the previous year's figure, the costs incurred amounted to R997,1 million, resulting in a surplus of R33,5 million. The surplus recorded in 1977 reduced the accumulated deficit, which at the end of 1976 stood at R39,0 million, to R5,5 million at the end of 1977. The average price per kWh sold increased by 48,1 per cent from 1,036 cents per kWh in 1976 to 1,535 cents in 1977.

On 1 January 1977 Escom imposed a tariff increase which was appreciably higher than the inflation rate which had contributed to Escom's increased expenditure. This tariff increase included a more substantial measure of internal financing by way of increased contributions to the Capital Development Fund, which consequently grew from R53,6 million in 1976 to R224,0 million in 1977. The desirability of increasing contributions to the Capital Development Fund was brought about by the uncertainties prevailing in the international money market. Whereas in 1976 the international money market provided 60 per cent of Escom's financing needs, during 1977 less than 25 per cent of its financial requirements was obtained from foreign sources.

Severe escalation of costs continued during 1977. The cost of fuel alone, having increased by 29 per cent in 1975 and 32 per cent in 1976, increased by a further 24 per cent in 1977.

Escom's capital expenditure during 1977 amounted to R983 million (R643 million in 1976). Capital cost escalation and the longer construction periods for the very large new power stations were the major contributors to the increased capital expenditure.

Electricity imports

After a period of testing and commissioning, the first stage of Cabora Bassa came on stream on 26 March 1977 when a supply was made available on a firm contractual basis of 700 MW, with a maximum load of 820 MW. In all 4 231,9 million kWh were imported from Cabora Bassa during the year. On 1 October 1977 transmission was suspended for the commissioning of the second stage, expected early in 1978, which will increase the firm supply to about 1 000 MW. During the period of commercial operation an availability of 98 per cent was attained in the supply.

Generating plant commissioned

Plant having a generating capacity of 1 120 MW was taken into service in 1977 (1 202 MW in 1976), and at the end of the year plant with a capacity of 12 044 MW was under construction or on order (13 164 MW in 1976). At Grootvlei power station the sixth and last 200 MW turbine-generator was taken into commercial service in October 1977. At Hendrina the tenth and final 200 MW non-reheat generating set was taken into commercial service in January 1977, while at Kriel power station the second of six 500 MW generating sets was taken into commercial service in May 1977. The second and last 120 MW generating set at Vanderkloof hydro power station was taken into commercial service in February 1977.

Nuclear power

Work on the Koeberg nuclear power station proceeded satisfactorily during the year under review. The major operation of excavating the overburden to bedrock and refilling with a soil cement mixture, a measure against potential earthquake hazards, was completed. Potential nuclear power station sites in other parts of the country were reviewed; it is expected that coastal sites on the Indian Ocean will receive closer attention than inland sites.

Megawatt Park

During the year Head Office staff moved from nine buildings in Braamfontein to Megawatt Park in Sandton. The building provides accommodation for just under 2 000 people, mainly in landscaped offices. This was the first time in more than ten years that Escom's Head Office staff was brought together in one building. This led to increased productivity and improved communication, both of which were difficult to achieve under the fragmented mode of operation created by working conditions in Braamfontein.

Statistical highlights

Operating statistics for the year

The power stations operated by Escom produced 88,5 per cent of all electricity generated in the Republic of South Africa in 1977

Maximum one-hour simultaneous demand on total interconnected system	10 735 MW
Total electricity sold	67 125 million kWh
Total coal burnt	37 505 644 tons
Total water consumed	201 088 megalitres

Plant in service at 31 December 1977

Total nominal generating capacity:

193 boilers with a total steam-raising output of 14 265 kg/s
146 turbo-generators, including gas-turbine and hydro-units, with a total power output of 13 556,0 MW

Major overhead transmission lines:

Direct current:

533 kV (monopolar)	1 030 km

Alternating current:

400 kV	6 231 km
275 kV	5 646 km
220 kV	1 043 km
132 kV	11 301 km
88 kV and below	74 842 km

Underground cables:

132 kV	20 km
33-88 kV	341 km
22 kV and under	6 286 km
Capacity of transformers	103 846 MVA

Financial

Total revenue for the year	R1 030 552 000
Total expenditure for the year	R997 097 000
Total capital investment in commercial operation at 31 December 1977	R2 851 103 000
Average cost per kWh sold	1,485 cents
Average price per kWh sold	1,535 cents

Staff – total employed at 31 December 1977

Whites	14 356
Non-whites	24 756

Commercial

Sales of electricity

In 1977 a total of 67 125 million kWh electricity was sold by Escom, reflecting a growth rate of 5,9 per cent over the preceding year (9,5 per cent in 1976). While the 1977 growth rate was appreciably lower than that achieved over the past number of years, it represents a steady increase in the demand for electricity during a period of economic recession.

In Table 1, sales of electricity to the various categories of consumers are given. The industrial sector dominated sales and also recorded the highest growth rate (8,4 per cent; 10,3 per cent in 1976). Bulk supplies, which also include sales to municipalities, constitute the next major sales category and showed a growth of 3,8 per cent during the year, appreciably lower than the 11,3 per cent achieved in 1976 and the average of 14,3 per cent recorded over the past five years. In the mining category, on the other hand, the demand continued to expand at a rate slightly above the average for the past five years, viz. 7,4 per cent in 1977 compared with the five-year average of 6,8 per cent.

Table 2 indicates sales of electricity to neighbouring territories. Here a drop occurred in the sales to Escom's principal foreign consumer, Mozambique, while increases were recorded in sales to Swaziland and Lesotho.

Sales of electricity to sectors of the mining industry (Table 3) showed growth rates higher than the average recorded for the past five years in all categories except asbestos, diamonds and platinum. Gold, the most important consumer in this category, reached a growth rate of 5,7 per cent which is somewhat higher than the average of 4,6 per cent recorded over the past five years. Coal achieved a growth rate of 15,9 per cent (9,8 per cent average over the past five years) and copper 20,1 per cent (15,7 per cent average over the past five years). The highest growth rate was recorded in the iron sector (50,6 per cent), followed by chrome (37,7 per cent), manganese (26,5 per cent), antimony (24,6 per cent) and copper (20,1 per cent).

In Table 4 sales of electricity to the various sectors in the industrial category are given. The biggest consumer in this category is engineering, iron, steel and base metals, which achieved a growth rate of 6,7 per cent (9,8 per cent in 1976). The highest growth rate for this category was recorded in the chemical sector (16,5 per cent in 1977, compared with 11,5 per cent in 1976). Foodstuffs, consumer goods and commercials showed a growth rate of 10,8 per cent, which is somewhat lower than the 14,8 per cent recorded for 1976. The building, cement and quarrying sector showed a growth of 1,8 per cent (−4,2 per cent in 1976). A negative growth rate was recorded in the paper and paper products sector (−1,7 per cent in 1977, compared with a 13,4 per cent growth in 1976).

The rates of growth of the sales in the individual distribution undertakings are discussed in detail towards the

Table 1
Sales of electricity to categories of consumers

Category of supply	1973	1974	1975	1976	**1977**	Percentage increase 1977/76	Average yearly increase over 5 years per cent
	Millions of kWh (GWh)						
Bulk supplies	12 751	15 522	18 055	20 096	**20 862**	3,8	14,3
Direct supplies:							
Domestic and street lighting	1 106	909	1 014	1 132	**1 041**	*−8,0	0,8
Industrial	14 026	16 105	18 049	19 907	**21 575**	8,4	11,3
Mining	15 800	16 941	17 444	18 746	**20 139**	7,4	6,8
Traction	2 895	3 108	3 307	3 475	**3 508**	0,9	4,7
Total	46 578	52 585	57 869	63 356	**67 125**	5,9	10,0
	Per cent of total						
Bulk supplies	27,4	29,5	31,2	31,7	**31,1**		
Direct supplies:							
Domestic and street lighting	2,4	1,7	1,8	1,8	**1,6**		
Industrial	30,1	30,7	31,2	31,4	**32,1**		
Mining	33,9	32,2	30,1	29,6	**30,0**		
Traction	6,2	5,9	5,7	5,5	**5,2**		
Total	100,0	100,0	100,0	100,0	**100,0**		

*Change in definition of domestic use.

end of this report. In Table 5 total sales of electricity in the various undertakings are given. Rand and O.F.S., Escom's largest undertaking, achieved a growth rate of 4,3 per cent (9,8 per cent in 1976). Natal Undertaking recorded an 8,2 per cent increase in sales (8,3 per cent in 1976), Eastern Transvaal 12,9 per cent (somewhat higher than the 10,5 per cent recorded in 1976) and Cape Western 2,0 per cent (5,9 per cent in 1976). Cape Northern Undertaking achieved a growth rate of 10,7 per cent (12,5 per cent in 1976), Orange River Undertaking 0,2 per cent (13,1 per cent in 1976), Border 7,7 per cent (12,9 per cent in 1976) and Cape Eastern 57,1 per cent (5,2 per cent in 1976).

The number of farm supplies increased by 9,7 per cent in 1977 from 34 661 to 38 010 (8,2 per cent in 1976). Most farming consumers are in the area served by the Rand and O.F.S. Undertaking (12 015, up 9,2 per cent on the 1976 figure), followed by Cape Western Undertaking (9 158, up 15,1 per cent which is also the highest growth rate for an undertaking recorded in this category) and Natal Undertaking (7 280, up 7,8 per cent).

Table 2
Sales of electricity to neighbouring territories, GWh

Neighbouring territories	1973	1974	1975	1976	**1977**
Bophuthatswana	—	—	—	—	****1,2**
Lesotho	19,7	26,2	31,4	41,9	**61,3**
Mozambique	151,2	215,5	203,1	216,5	**168,2**
Rhodesia	—	4,8	9,6	10,8	**9,4**
Swaziland	8,4	19,1	38,6	48,1	**101,1**
Transkei	—	—	—	*9,2	**67,8**
Total	179,3	265,6	282,7	326,5	**409,0**

*Sales since date of independence 26 October 1976.
**Sales since 8 November 1977; date of independence 6 December 1977 (November sales 199 900 kWh, December sales 520 060 kWh).

Table 3
Sales of electricity to sectors of the mining industry, GWh

Mining category	1973	1974	1975	1976	**1977**	Percentage increase 1977/76	Average yearly increase over 5 years per cent
Antimony	42	51	53	61	**76**	24,6	16,8
Asbestos	168	193	238	266	**275**	3,4	11,3
Chrome	33	52	42	61	**84**	37,7	22,1
Coal	620	648	705	812	**941**	15,9	9,8
Copper	565	653	679	728	**874**	20,1	15,7
Diamonds	334	338	346	343	**342**	−0,3	1,0
Gold	12 263	12 803	13 108	13 918	**14 708**	5,7	4,6
Iron	86	104	121	180	**271**	50,6	28,3
Manganese	27	30	37	49	**62**	26,5	21,9
Platinum	1 581	1 978	2 001	2 184	**2 287**	4,7	18,2
Other	81	91	114	144	**219**	52,1	21,7
Total	15 800	16 941	17 444	18 746	**20 139**	7,4	6,8

Table 4
Sales of electricity to sectors of industry, GWh

Sector of industry	1973	1974	1975	1976	**1977**	Percentage increase 1977/76	Average yearly increase over 5 years per cent
Building, cement and quarrying	1 096	1 148	1 115	1 068	**1 087**	1,8	4,4
Chemical	1 921	2 160	2 382	2 655	**3 092**	16,5	13,5
Engineering, iron, steel and base metals	7 687	8 835	10 180	11 173	**11 927**	6,7	11,7
Foodstuffs, consumer goods, commercial and other	2 747	3 359	3 790	4 350	**4 819**	10,8	11,9
Paper and paper products	575	603	583	661	**650**	−1,7	4,6
Total	14 026	16 105	18 050	19 907	**21 575**	8,4	11,3

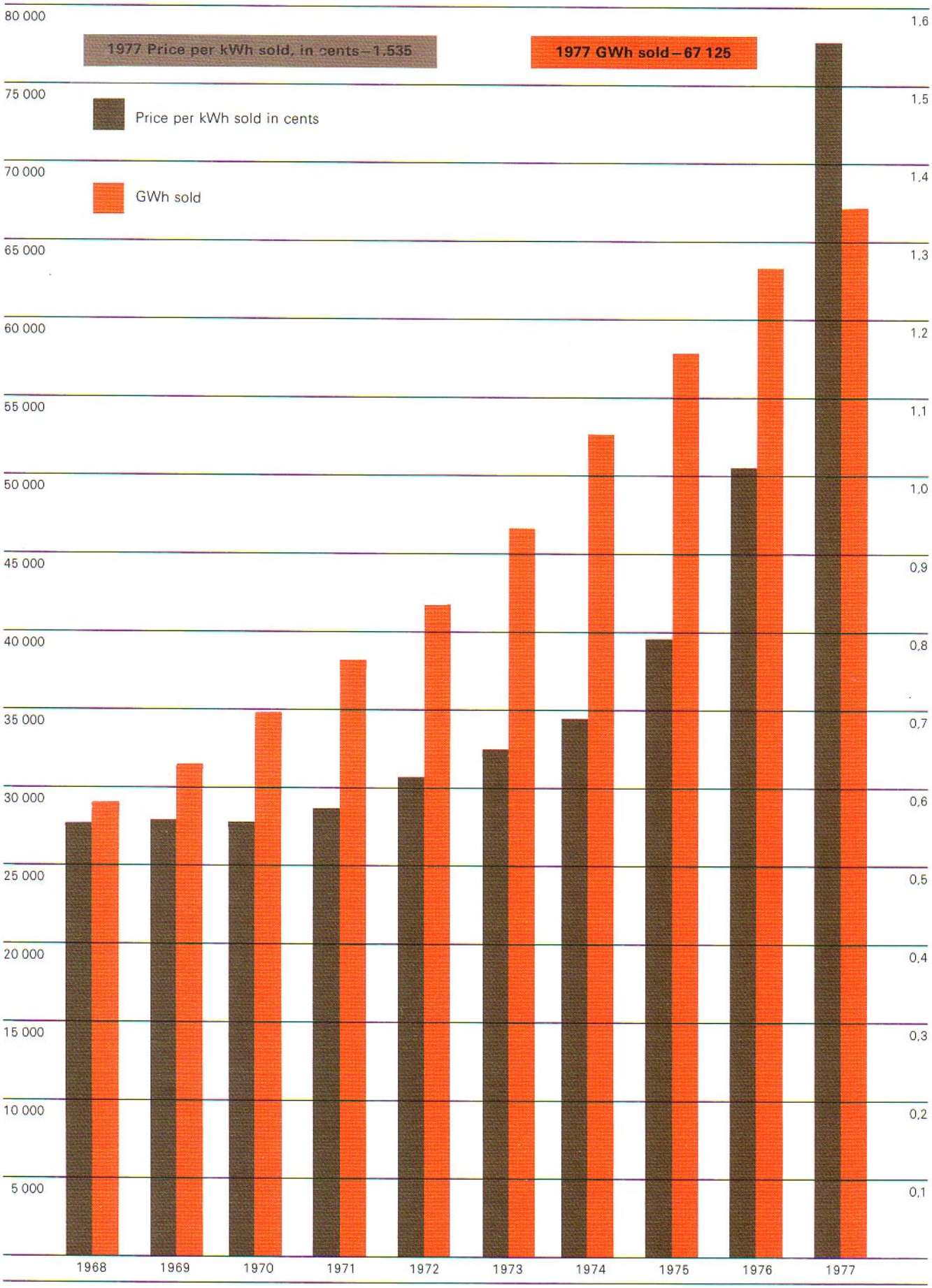
Table 5
Total sales of electricity in Escom distribution undertakings, GWh

Undertaking	1973	1974	1975	1976	**1977**	Percentage increase 1977/76	Average yearly increase over 5 years per cent
Border	504	551	598	675	**727**	7,7	10,2
Cape Eastern	9	11	13	14	**22**	57,1	22,4
Cape Northern	1 060	1 211	1 340	1 507	**1 668**	10,7	13,2
Cape Western	3 149	3 852	4 656	4 930	**5 028**	2,0	12,7
Eastern Transvaal	6 098	6 527	7 267	8 028	**9 062**	12,9	11,6
Natal	7 581	8 500	9 166	9 931	**10 747**	8,2	9,1
Orange River	239	786	915	1 035	**1 037**	0,2	48,4
Rand and O.F.S.	27 938	31 147	33 914	37 236	**38 834**	4,3	9,0
Total	46 578	52 585	57 869	63 356	**67 125**	5,9	10,0

Table 6
Total number of farm supplies at the year end

Undertaking	1973	1974	1975	1976	**1977**	Percentage increase 1977/76	Average yearly increase over 5 years per cent
Border	716	773	805	864	**940**	8,8	6,4
Cape Eastern	432	475	511	525	**512**	−2,5	5,7
Cape Northern	2 130	2 240	2 336	2 497	**2 614**	4,7	5,2
Cape Western	6 389	6 772	7 533	7 959	**9 158**	15,1	8,6
Eastern Transvaal	3 634	4 080	4 474	4 864	**5 284**	8,6	10,6
Natal	5 080	5 578	6 150	6 752	**7 280**	7,8	9,4
Orange River	73	137	173	197	**207**	5,1	52,6
Rand and O.F.S.	8 398	9 248	10 065	11 003	**12 015**	9,2	9,7
Total	26 852	29 303	32 047	34 661	**38 010**	9,7	9,1

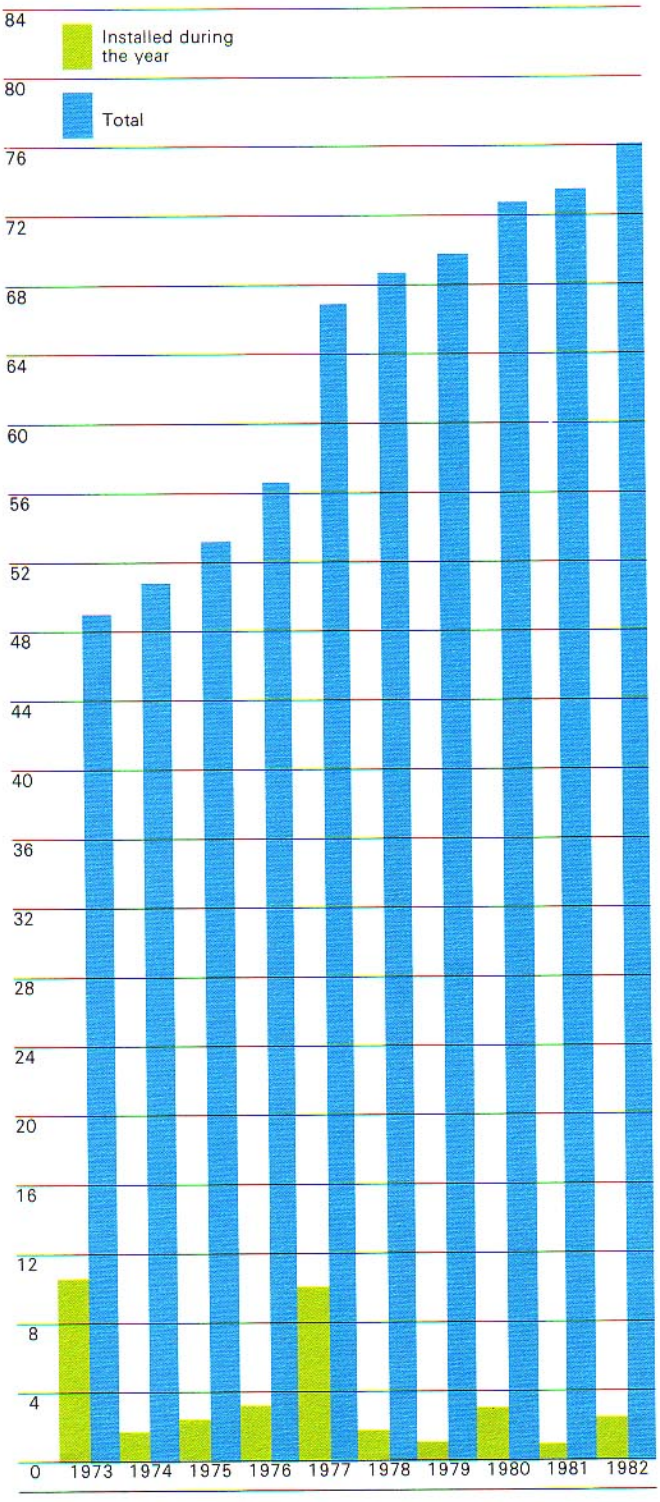
Electricity sales



Expansion of Escom's transmission system

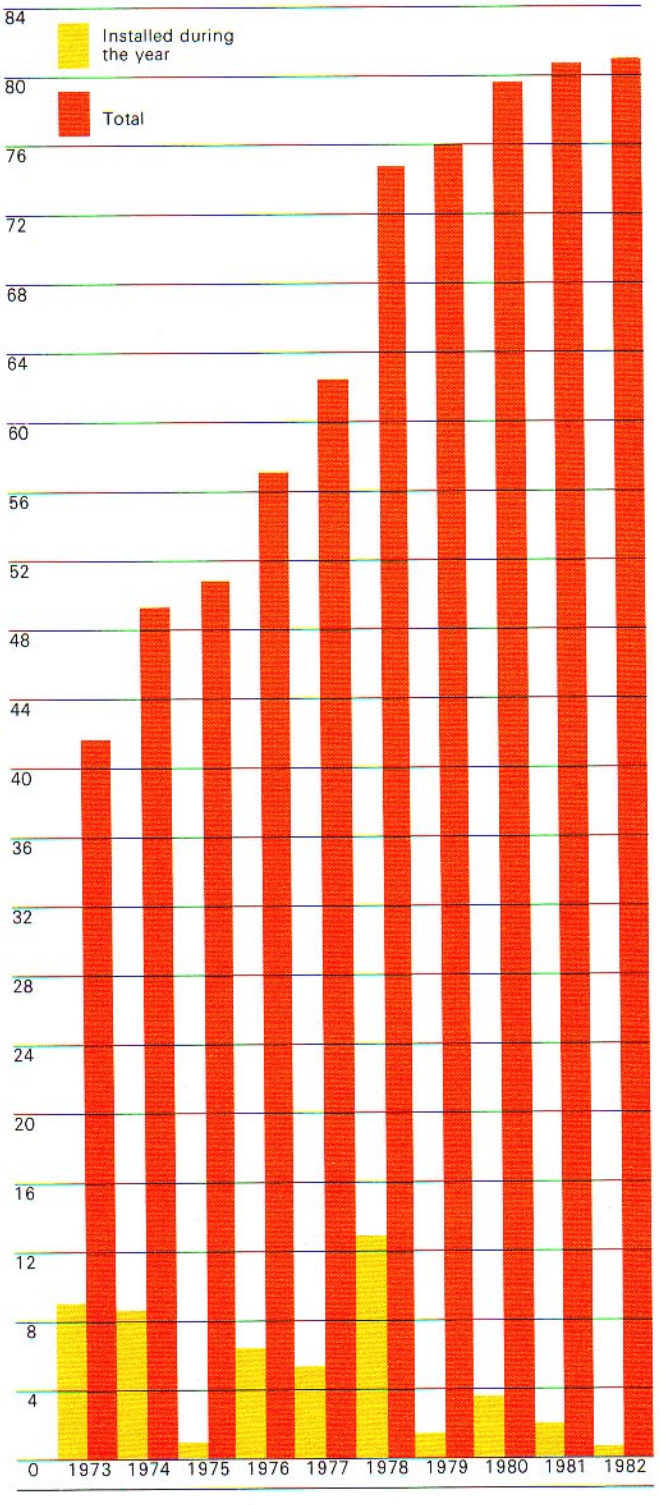
275 and 220 kV lines, km			Planned		
1973	1 068,5	4 894,2	1978	192	6 880,6
1974	161,6	5 055,8	1979	101	6 981,6
1975	284,6	5 340,4	1980	316	7 297,6
1976	*319,9	*5 660,3	1981	92	7 389,6
1977	1 028,3	6 688,6	1982	220	7 609,6

88 Hundreds of kilometres



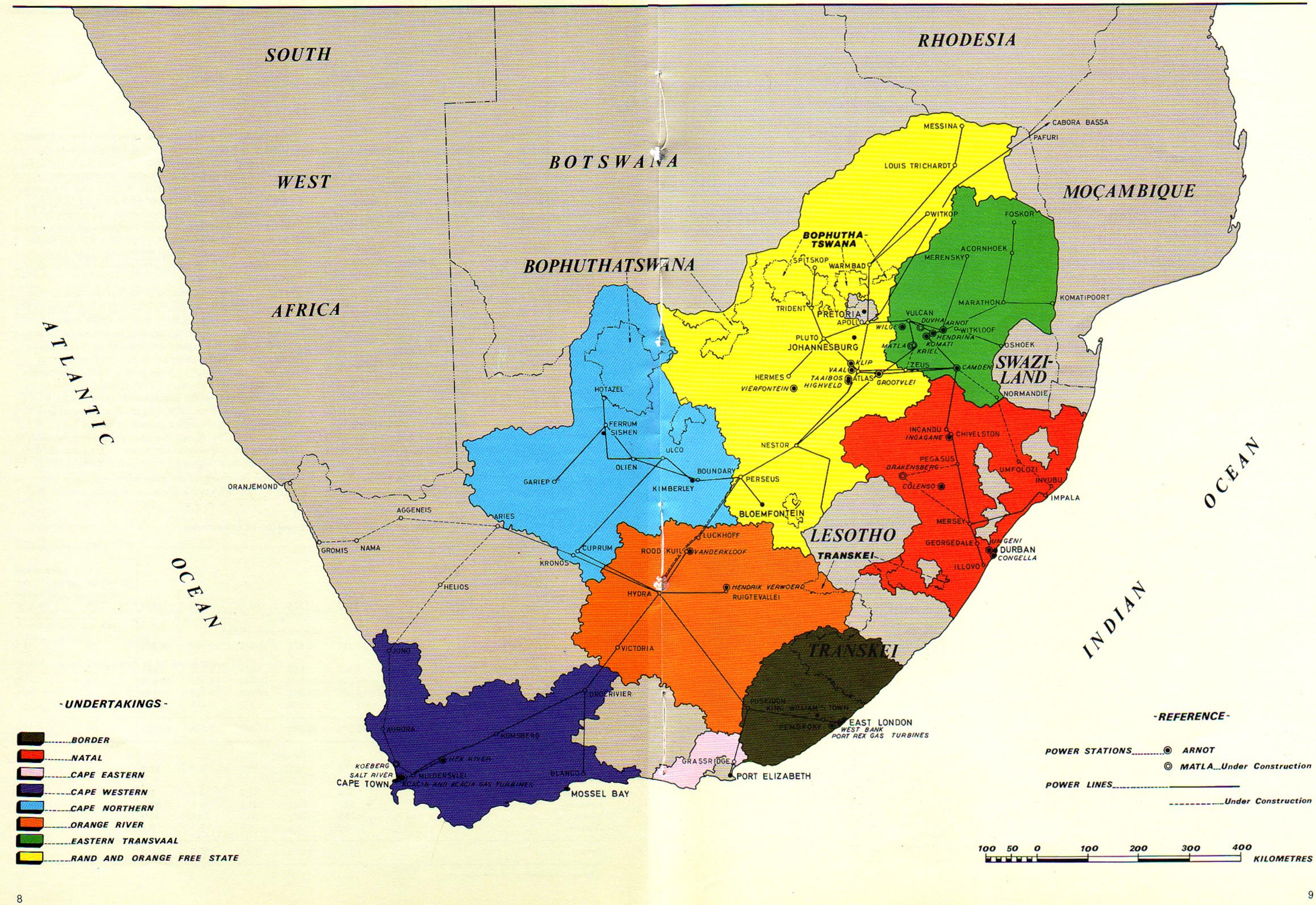
400 kV lines, km			Planned		
1973	922,2	4 196,7	1978	1 261	7 492,2
1974	842,8	5 039,5	1979	109	7 601,2
1975	059,3	5 098,8	1980	351	7 952,2
1976	*646,2	*5 745,0	1981	150	8 102,2
1977	486,2	6 231,2	1982	24	8 126,2

88 Hundreds of kilometres



*Amended figures

ESCOM MAP SHOWING UNDERTAKINGS AND NATIONAL GRID



Tariffs

Continued escalation of costs, combined with the need to expunge an accumulated deficit of R39 million on the Electricity Supply Account as at end 1976 and the necessity for raising more of its capital requirements via internal financing, compelled Escom to impose a general tariff increase of 25 per cent with effect from January 1977 in all distribution undertakings. The financing difficulties experienced prior to 1977 were sufficiently serious to justify an amendment to the Electricity Act in 1977 which had the effect of raising both the rate of annual contributions and the upper limit of accumulated contributions from revenue to the Capital Development Fund.

In September 1977 tariff increases were announced for all but two of the distribution undertakings with effect from January 1978, while a further increase is to be introduced in the Orange River undertaking in July 1978. The overall average increase, approximately 15 per cent, provides for the maximum level of internal financing of capital expenditure now statutorily permissible following the 1977 amendment.

The upward adjustments applicable to the different distribution undertakings are indicated in the table which follows. The surcharges or discounts are applicable only to the standard tariff charges, and not to extension charges and other fixed contractual payments.

By adjustment of the surcharges and discounts from year to year, Escom's total revenue and expenditure can be balanced without requiring any change to the standard tariffs themselves.

When altering the structure of tariffs the practice has been adopted to introduce the new tariffs with initial discounts. Amended tariffs subject to discounts had been introduced in 1976 in our Border, Cape Eastern, Cape Western, Natal and Orange River undertakings. The application of a uniform increase of 25 per cent to the tariffs of all undertakings from January 1977, regardless of the previous surcharge or discount in force in each undertaking, resulted in the pattern of differing surcharges and discounts shown in the table for the year 1977. Further adjustment on a selective basis, according to the local circumstances in each distribution undertaking, has resulted in the different discounts and surcharges tabulated for the year 1978.

To understand the impact on tariffs of Escom's striving for increased internal financing of its capital expenditure, some appreciation is necessary of the purpose and operation of the Capital Development Fund. The creation of this fund in 1971, and the increased annual contributions made possible by the 1977 amendment, do not mean any radical departure from Escom's long-established practice of raising its capital requirements for expansion by means of loans. The setting-up of this fund and the internal investment thereof in Escom stock have the effect of lessening the Commission's dependence on borrowings from external sources. Further details of this aspect of the Capital Development Fund are given in the financial section of this report.

It is prescribed by the Electricity Act that the Capital Development Fund must be invested in Escom stock, and that the interest earned thereon must accrue to that fund. The interest charge on these investments forms a part of Escom's total interest burden and would, in the absence of a capital development fund, be paid to external investors. The burden placed on tariffs by the Capital Development Fund is consequently limited to the amount of the annual contribution. The relatively severe tariff increases in 1977 and 1978 were necessary to step up the annual contributions in each of those two years. The new levels permitted by the 1977 amendment of the Act have now been reached, and further increases on this account will not be necessary.

With this understanding of the mechanism of Escom's internal financing through the Capital Development Fund, it will be appreciated that the relatively severe increases in tariffs imposed in recent years have, of necessity, exceeded the level of the general inflation rate as measured by the accepted indices such as the wholesale price index. On the other hand, the improved efficiency arising from the greater scale of Escom's operations and the establishment and progressive extension of the national transmission network have curtailed increases in operating costs per kWh of electricity sold.

Koeberg, Escom's first nuclear power station, now under construction near Cape Town

Table 7
Surcharges and discounts on standard tariffs in the distribution undertakings

Distribution Undertaking	Discount or surcharge applicable from January 1977, per cent	Discount or surcharge applicable from January 1978, per cent	Effective increase compared with 1977 tariff level, per cent
Border	Discount 5,0	Discount 5,0	Nil
Cape Eastern	Surcharge 22,5	Surcharge 40,0	14,3
Cape Northern	Surcharge 75,0	Surcharge 112,5	21,4
Cape Western	Discount 5,0	No discount or surcharge	5,3
Eastern Transvaal	Surcharge 47,5	Surcharge 77,5	20,3
Natal	Discount 5,0	Discount 5,0	Nil
Orange River	Discount 5,0	Surcharge 20,0	26,3
		Surcharge 30,0*	36,8
Rand and O.F.S.	Surcharge 65,0	Surcharge 97,5	19,7

*Applicable from July 1978.

Operations

The supply from Cabora Bassa was made available on 26 March 1977 on a contractual basis of 700 MW, with a maximum load of 820 MW. The energy imported from Cabora Bassa during 1977 amounted to 4 231,9 million kWh.

The transmission on a contractual basis from Cabora Bassa was suspended on 1 October 1977 for the commissioning of the second stage, anticipated early in 1978, which will increase the firm supply from 700 MW to about 1 000 MW. Considerable progress was made during the year in improving the technical quality of the Cabora Bassa supply, and during the period of commercial operation an availability of 98 per cent was attained.

The reserve plant margin on the Escom system improved during the year with the Cabora Bassa supply becoming available and the commissioning of 1 075 MW of generating capacity (sent out). During the year the Vanderkloof hydro station, with two generating sets of 110 MW each, was placed in service. Hendrina and Grootvlei power stations were completed with the commissioning of the tenth and sixth sets respectively, and the second set at Kriel went on load at mid-year.

The above-mentioned plant installations increased the reserve plant margin at the time of the integrated system peak load for the year to 22,3 per cent (13,6 per cent in 1976, and 11,0 per cent in 1975).

The improved plant position, as compared with the previous years, enabled Escom to reduce the load on the

low merit stations considerably. The load factor on Klip power station was reduced from 48,7 per cent in 1976 to 44,4 per cent in 1977 (see Statement 4). The results achieved on the expensive coastal stations were even more spectacular. The 1976 figure for coal consumed in the Western Cape was reduced by 25,5 per cent (Table 11). The corresponding figures for Natal and the Eastern Cape are 12,1 per cent and 19,7 per cent respectively.

During the year under review 21,7 per cent of Cape Western Undertaking's electricity needs were met from the Cape stations as compared with 30,9 per cent in 1976. In Natal stations burning railborne coal supplied 12,0 per cent of the energy to Natal Undertaking as against 16,0 per cent in 1976. The local generation in Border Undertaking was reduced from 43,9 per cent in 1976 to 30,2 per cent in 1977.

Generation of electricity

The energy supplied to the distribution undertakings during the year amounted to 71 291,5 million kWh, an increase of 5,75 per cent on 1976. During the preceding five years the annual kilowatt hours sent out increased at more than 9 per cent per annum. The kilowatt hours sent out from Escom's power stations increased by only 1,3 per cent in 1977; the balance is made up by the imports from Cabora Bassa (Table 8).

Table 8
Source and destination of Escom's supplies of electricity, GWh
(consumption of power station auxiliaries excluded)

	1973	1974	1975	1976	**1977**
Sent out from Escom power stations	49 759,1	56 251,2	61 498,4	66 188,2	**67 050,5**
Purchased (see Statement No. 2)	11,3	7,9	34,9	1 225,5	**4 241,0**
Total supplies sent out	49 770,4	56 259,1	61 533,3	67 413,7	**71 291,5**
Supplied to undertakings:					
Border	520,2	594,3	648,2	734,0	**790,1**
Cape Eastern	11,3	13,1	18,5	20,7	**25,2**
Cape Northern	1 182,6	1 345,9	1 494,9	1 674,6	**1 832,4**
Cape Western	3 495,8	4 241,3	5 098,6	5 402,8	**5 555,9**
Eastern Transvaal	6 205,4	6 679,0	7 309,6	8 122,1	**9 400,4**
Natal	8 041,1	9 087,1	9 671,5	10 471,1	**11 319,8**
Orange River	257,8	822,3	968,3	1 086,1	**1 096,2**
Rand and O.F.S.	30 036,2	33 459,3	36 304,4	39 902,3	**41 244,7**
Central Generating Undertaking: own consumption	20,0	16,8	19,3	*—	****26,8**
Total supplied	49 770,4	56 259,1	61 533,3	67 413,7	**71 291,5**
Percentage increase (+) compared with previous year	11,88	13,04	9,37	9,56	**5,75**

*Extraneous supplies, such as river pumps, townships, workshops, etc., previously regarded as Central Generating Undertaking's own consumption, are now included in the distribution undertakings' supplies and treated as sales to Central Generating Undertaking.

**Energy consumed at Hendrik Verwoerd, Vanderkloof, Acacia and Port Rex power stations when operated in the synchronous condenser mode.

Capacity of the Republic's Power Stations, MW

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Installed by Escom during the year, MW	590	550	550	1 202	1 120	1 000	1 700	2 300	1 700	1 700
Escom total installed capacity at year end, MW (after allowing for expected decommissioning of obsolete plant.)	10 141	10 691	11 241	12 443	13 556	14 556	16 074	18 374	20 074	21 774
Total capacity installed in Republic at year end, MW (after allowing for expected decommissioning of obsolete plant.)	13 109	13 622	14 134	15 344	16 405	17 493	19 073	21 431	23 139	24 839

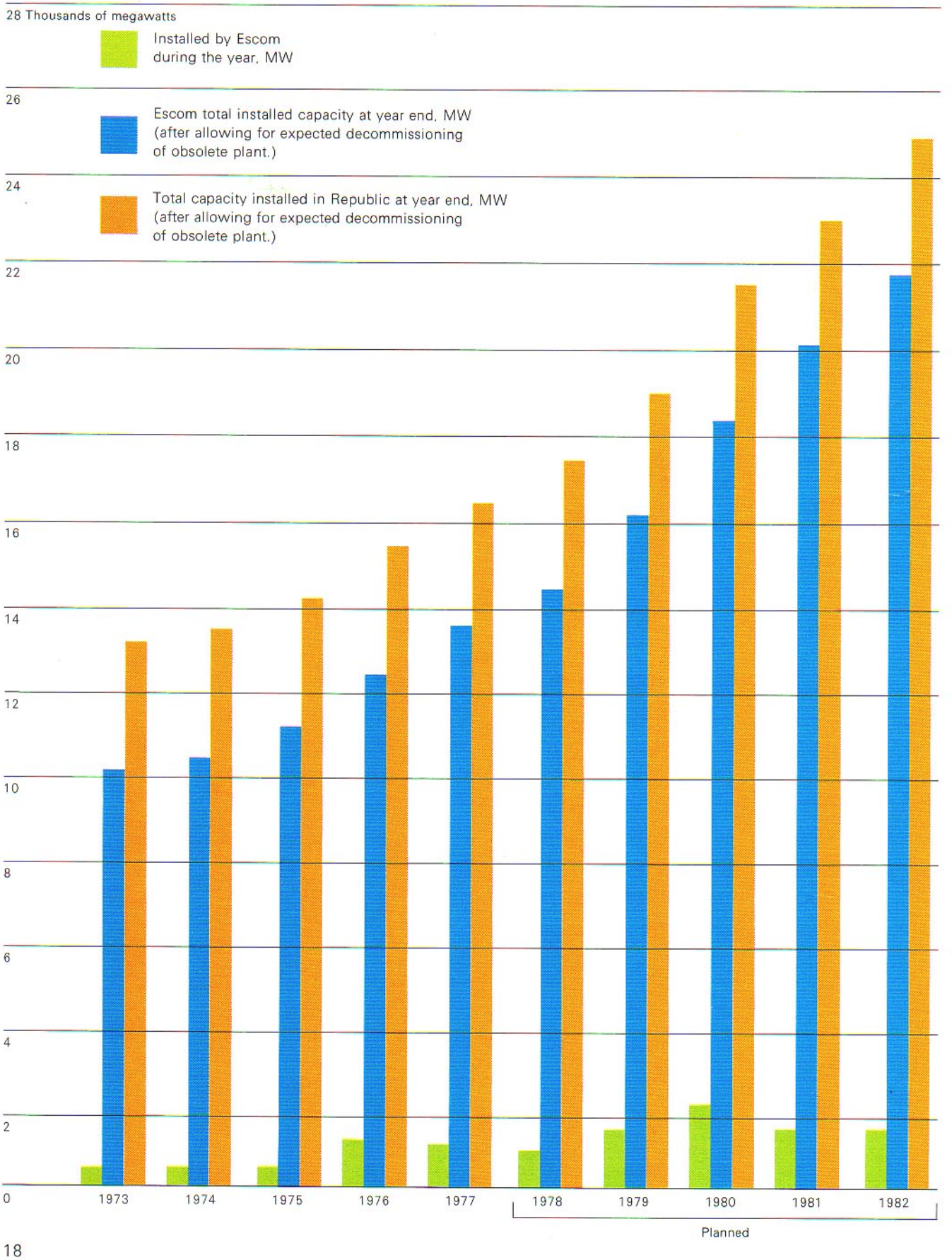


Table 9
Demand in each undertaking at the time of maximum demand on total Escom system, megawatts

Undertaking	Year	1968	1969	1970	1971	1972	1973	1974	1975	1976	**1977**
	Time	12h00	09h00	12h00	09h00	10h00	19h00	09h00	09h00	09h00	**09h00**
	Date	13/6/68	25/7/69	16/7/70	17/6/71	1/8/72	13/7/73	4/9/74	24/7/75	23/6/76	**12/8/77**
Border		63,1	59,0	69,0	74,0	87,0	91	106	124	132	**141**
Cape Northern		110,3	114,5	136,8	144,8	163,0	197	218	241	250	**282**
Cape Western		273,0	315,5	357,5	432,4	470,4	542	647	779	840	**795**
Eastern Transvaal		456,1	541,2	598,2	565,8	772,0	827	946	990	1 089	**1 299**
Natal		635,7	747,4	825,3	994,0	1 088,0	1 222	1 438	1 498	1 567	**1 718**
Orange River		—	—	10,3	18,3	23,0	31	114	105	*132	***137**
Rand and O.F.S.		3 119,4	3 277,1	3 624,4	3 885,9	4 026,8	4 440	5 083	5 448	6 075	**6 363**
Maximum simultaneous demand on total Escom system		4 657,6	5 054,7	5 621,5	6 115,2	6 630,2	7 350	8 552	9 185	10 085	**10 735**

*Includes demand taken by Cape Eastern Undertaking.

Table 10
Hourly maximum demand of Escom's distribution undertakings, megawatts

Undertaking	1968	1969	1970	1971	1972	1973	1974	1975	1976	**1977**
Border	64,9	67,7	70,2	80,3	88,3	100,8	114,0	127,0	145,0	**148,0**
Cape Eastern	1,7	2,0	2,0	2,3	2,5	2,3	5,1	5,2	5,7	**6,8**
Cape Northern	117,5	127,3	139,8	157,1	170,1	201,9	231,0	249,5	273,2	**299,4**
Cape Western	298,6	326,8	389,8	442,8	491,7	554,1	707,1	807,0	882,0	**890,0**
Eastern Transvaal	485,2	575,5	615,3	680,4	786,1	867,8	924,6	1 019,8	1 197,1	**1 316,3**
Natal	712,0	794,0	867,0	1 060,0	1 177,0	1 263,0	1 438,0	1 498,0	1 618,0	**1 761,0**
Orange River	—	7,6	12,4	20,5	30,3	88,2	117,5	135,2	179,9	**160,2**
Rand and O.F.S.	3 119,4	3 277,1	3 624,4	3 885,9	4 054,9	4 467,8	5 147,0	5 455,5	6 074,8	**6 363,2**
Aggregate of non-simultaneous maximum demands	4 799,3	5 178,0	5 720,9	6 329,3	6 800,9	7 545,9	8 684,3	9 297,2	10 375,7	**10 944,9**

The hourly maximum demand in 1977 on the Escom interconnected system was 10 735 MW, an increase of 6,45 per cent on the maximum demand of 1976. Rand and O.F.S. Undertaking still constitutes the major demand centre in the Republic and contributed 59,3 per cent towards the maximum load on the Escom system. The second largest contribution, that of Natal Undertaking, amounted to 16,0 per cent. By comparing the aggregate of the distribution undertakings non-simultaneous maximum demands (Table 10) with the hourly maximum demand on the interconnected system, the system diversity factor is obtained, which for 1977 amounts to only 1,02. From this figure it is apparent that the loads in the different geographical supply areas are largely coincidental, both seasonally and with respect to time of day.

The annual system load factor for 1977, based on the total energy sent out and the maximum demand on the Escom system, was 75,8 per cent. The corresponding figure for 1976 was 76,1 per cent. In Statement No. 4 in the appendix, the output of the different power stations for 1977 are given. The coal-fired power stations contributed 97,1 per cent of the total kilowatt hours sent out by Escom power stations during 1977, hydro stations 2,87 per cent, and gas turbines the remainder. The coal-fired stations attained an overall load factor of 64,6 per cent for the year. Escom's hydro stations on the Orange River again had a relatively good year with an annual load factor of 42,1 per cent. However, due to the reduced amount of water available in 1977 the load factor was significantly lower than the 1976 figure of 68,9 per cent.

Plant performance and maintenance

As was previously stated the improved reserve plant margin enabled Escom to operate its power stations more economically during 1977. The load factors on the low merit stations such as Colenso, Umgeni and Salt River, were reduced to acceptable levels. In general it was also possible to achieve better efficiencies on the older stations.

With the increasing number of modern high efficiency stations in the Escom system it was again possible to reduce the coal consumed per kWh sent out, notwith-

standing a further drop in the average heat content value of the coal consumed during the year. During the past five years the heat content of the coal used by Escom has decreased on the average by 0,1 per cent per year. (See Statement No. 10).

The availability of the coal-fired power stations decreased from 82,1 per cent in 1976 to 77,5 per cent in 1977. Overall, the availability of the Escom power stations decreased from 82,3 per cent to 78,5 per cent. The deterioration in availability can partially be attributed to the low reserve plant margins in the previous three years which curtailed Escom's maintenance programme on a large scale. Consequently the forced outage rate of the major generating equipment showed a sharp increase during 1977. The maintenance department used the opportunity afforded by the healthier reserve plant margin to increase the amount of planned maintenance performed on the plant.

Problems experienced during 1977 with generating equipment were of a varied nature. Extensive boiler slagging persisted at two new stations, but the modifications to eliminate this defect are well advanced. Outages due to turbine blade failures, both low and high pressure, were costly as were the failures of electric rotors. Problems with boiler feed heaters, milling plant, erosion of boiler tubes, etc. contributed to the reduction in the overall availability of the power stations.

There were no major system-wide interruptions in supply to consumers during 1977 and it was possible to localise and contain all interruptions to consumers. Most of the interruptions to consumers were caused by cane and veld fires resulting in the tripping of transmission lines. Industrial pollution in certain geographic areas is still proving a problem, leading to contamination of insulators with resultant line outages. The problem of bird pollution has shown an appreciable decrease during 1977 which can partially be attributed to the strategic placing of bird guards on transmission lines.

Significant progress has been made with live-line maintenance of transmission lines, and all six distribution undertakings now have teams skilled in all three techniques, namely bare-hand, stick and cover-up. Extensive and intensive training programmes have been worked out by Escom's Education Department and courses are being conducted by this Department on a regular basis. Most routine maintenance work can be undertaken by live-line techniques on all Escom's transmission lines including the direct-current line from Cabora Bassa.

Coal supplies

The amount of coal burnt in Escom power stations during 1977 showed an increase of only 0,7 per cent over the previous year (8,8 per cent in 1976), despite an increase of 5,9 per cent in electricity sold. This was largely brought

about by more electricity being obtained from hydro stations and reduced use of the mid merit power stations, particularly the expensive coastal stations. It is significant that rail tariff increases resulted in 1977 in an average increase of R4,71 per ton for Western Cape coal, whereas pithead coal rose by R0,78 per ton.

In conjunction with the slowing down in Escom's demand for coal, a dramatic improvement occurred in the availability and supply of coal during the year. Most of the production problems which existed during 1976 at certain of the collieries supplying Escom, were greatly relieved during 1977. It was thus not necessary to embark on large scale importation of coal to certain pithead stations as was the case the previous year. Coal was also more readily available from the commercial collieries and all the non-pithead stations were adequately supplied. As a result of the good supplies it was possible to increase coal stocks to a satisfactory level at all power stations.

As far as mining operations are concerned, the longwall operation at Coalbrook successfully completed its second face and continuous miners were introduced to overcome difficult roof and dyke conditions. A start was made in recovering coal from ash-filled areas and shows promise of being successful. The two opencast operations continue to provide coal at a very competitive price and the restoration of worked ground is proceeding satisfactorily along the lines laid down in a code of practice. About 20 per cent of Escom's coal supplies now come from major opencast operations and mini-pits have been used to meet limited local demands. This feature has meant that increased requirements are being met without making calls on traditional industry resources, and new skills in mining are being developed.

During the year a survey of potential coal supplies for future power stations was undertaken. Sufficient coal for Escom's planned requirements until the end of the century, is indicated. Steps will have to be taken in the near future, however, to explore new coal fields if these areas are to be ready to support major power stations when required.

Water supplies

The water consumed in Escom's coal-fired power stations during 1977 and 1976, is given in Table 13. The crude river-water consumed showed an increase of 5,9 per cent over the 1976 consumption and specific water consumption increased from 2,87 litres per kWh in 1976 to 2,99 litres per kWh sent out in 1977. All the power stations in the Transvaal and O.F.S., except Kriel, used more water per kWh during 1977. The problems included deterioration of the water quality necessitating increased blowdowns, the introduction of more stringent standards, alterations to the drain return systems, and lower loadings on certain power stations leading to higher specific consumption.

Table 11
Coal burnt per year in different areas, millions of tons

Geographic area	1973	1974	1975	1976	**1977**	Percentage increase 1977/76	Average yearly increase over 5 years per cent
Eastern Cape*	0,295	0,150	0,177	0,213	**0,171**	−19,7	−3,7
Natal	2,013	2,117	2,557	2,938	**2,583**	−12,1	+2,2
Transvaal and O.F.S.	25,009	27,998	30,727	33,128	**34,022**	+ 2,7	+9,6
Western Cape	0,591	0,627	0,770	0,978	**0,729**	−25,5	+5,1
Total	27,908	30,892	34,231	37,257	**37,505**	+ 0,7	+8,6

*Incorporated in Central Generating Undertaking as from 1974.

Table 12
Yearly average cost of coal burnt in different areas, rand per ton

Geographic area	1973	1974	1975	1976	**1977**	Percentage increase 1977/76	Average yearly increase over 5 years per cent
Eastern Cape*	8,17	8,87	11,33	14,10	**17,50**	+24,1	+20,9
Natal	4,13	4,96	6,98	9,29	**10,74**	+15,6	+22,1
Transvaal and O.F.S.	2,03	2,58	3,51	**4,63	**5,41**	+16,8	+24,6
Western Cape	9,06	10,04	12,81	**15,63	**20,34**	+30,1	+22,5
Overall average	2,39	2,92	4,02	**5,34	**6,12**	+14,6	+22,7
Percentage increase compared with previous year	6,2	22,2	37,7	**32,8	**14,6**		

*Incorporated in Central Generating Undertaking as from 1974.
**Amended figures.

Table 13
Water used in Escom coal-fired power stations, megalitres (includes colliery and construction usage)

Area and source of water	Potable water		Crude river-water		Water from other sources, including boreholes, dams and sewage		Sea-water circulated (estimated)	
	1976	**1977**	1976	**1977**	1976	**1977**	1976	**1977**
Eastern Cape								
East London Municipality	137	**147**						
Sea-water (estimated)							100 444	**70 700**
Total, Eastern Cape	137	**147**					100 444	**70 700**
Natal								
Durban Municipality	3 672	**3 180**						
Sea-water (estimated)							138 621	**132 316**
Tugela River			2 576	**2 252**				
Ngagane River			10 472	**12 411**				
Total, Natal	3 672	**3 180**	13 048	**14 663**			138 621	**132 316**
Transvaal and O.F.S.								
Vaal River	*1 651	***1 564**	52 138	**54 897**				
Bronkhorstspruit			6 717	**6 874**	666	**648**		
Komati River			79 326	**79 169**				
Usutu complex			31 619	**38 499**				
Hendrik Verwoerd Dam					66	**74**		
Other	*146	***80**						
Total, Transvaal and O.F.S.	*1 797	***1 644**	169 800	**179 439**	732	**722**		
Western Cape								
Cape Town Municipality	434	**323**						
Worcester Municipality	666	**827**						
Hex River			643	**143**				
Sea-water (estimated)							293 543	**238 885**
Total, Western Cape	1 100	**1 150**	643	**143**			293 543	**238 885**
Total, all Escom	6 706	**6 121**	183 491	**194 245**	732	**722**	532 608	**441 901**

*Includes water consumed by substations in Transvaal and O.F.S.

New works

Generating plant

Generating plant commissioned during 1977, as well as the plant under construction at the end of 1977 is listed in Table 14. Plant having a generating capacity of 1 120 MW was taken into service during the year (1 202 MW in 1976), bringing the total installed capacity to 13 556 MW as shown in Statement No. 1.

Power station projects

Construction work on the following major power station projects was completed or continued during the year.

Matla power station

Initial difficulties with the supply of material for the first and second boilers extended their completion dates by six and three months respectively. The programme for the subsequent boilers can be maintained. Work on the turbine generators proceeded well. The sliding form concrete structures for the first two boilers and the turbine house for the first two units were completed, as were the first chimney and cooling tower. Most of the contracts for the second half of the station have been awarded and construction has already started.

Grootvlei power station

The sixth and last 200 MW boiler and turbine generator unit was completed in November. This is the second unit at Grootvlei to use the dry cooling system. In this case the system incorporates a conventional surface condenser forming a closed circuit with the cooling tower.

Hendrina power station

The tenth 200 MW non-reheat generating set in this power station was taken into commercial service in January 1977. With the tenth set in service the construction of the power station, which now has a nominal generating capacity of 2 000 MW, is complete.

Kriel power station

Civil and structural work for five of the six 500 MW units were completed during the year. The second unit was taken into operation in May 1977 and it is planned to take the third into commercial operation in January 1978 and the fourth in June 1978. The third cooling tower, second coal staith, two raw water reservoirs and station roads were completed.

Modifications to one unit to overcome slagging resulted in full output being sustained without serious problems. Although not a complete solution, the modifications are scheduled to be undertaken on other units while investigations continue.

Re-mounting of the coal mill foundation on vibration absorbing springs has proved to be completely satisfactory in solving a problem of vibration within the building.

The performance of this power station has been adversely affected by a number of problems which have now been overcome.

Duvha power station

Work on the boiler and turbine house proceeded well after a late start caused by difficulties experienced with

Table 14
Power station plant taken into service during 1977 and on order at 31 December 1977

Name of power station	Plant taken into service in 1977		Plant under construction or on order at 31 December 1977	
	Boilers kg/s	Generators MW	Boilers kg/s	Generators MW
Coal-fired steam plant:				
Duvha	—	—	3 048	3 600
Grootvlei	215	200	—	—
Hendrina	214	200	—	—
Kriel	440	500	1 760	2 000
Matla	—	—	3 048	3 600
Conventional storage hydro plant:				
Vanderkloof	—	220	—	—
Pumped storage hydro plant:				
Drakensberg	—	—	—	1 000
Nuclear plant:				
Koeberg	—	—	—	1 844

Boiler and turbine houses under construction at Duvha power station

the 100 ton gantry erection crane, one of the largest of its kind in the world. A start was made with the foundations of three cooling towers in the second half of the year. At the same time work commenced on the civil works of other auxiliary plant. Erection of the first boiler and turbine is to commence in January 1978 and completion is scheduled for September 1979.

Drakensberg Pumped Storage Scheme

Major difficulties occurred with the method of underground excavation and support of the roof and side-walls of tunnels and waterways. These arose from the rock conditions involving high residual stresses. As a result the completion of the main access tunnel and tailrace tunnel was delayed, with the consequent access problems for subsequent underground works.

The top headings of the machine hall, valve hall and transformer hall were completed, and work has begun on the downward excavation of these caverns. The hydraulic behaviour of the headrace intake and waterway system was evaluated by means of a mathematical and hydraulic model specially developed for this purpose so as to ensure satisfactory operation under all conditions. Major contracts were awarded during the year for the construction of the headrace tunnels and for the supply of other plant and equipment. As a result of delays in excavation work, the commissioning of the first 250 MW unit is now scheduled for July 1981. The second, third and fourth units are planned for commissioning at four-monthly intervals to complete the station to an installed capacity of 1 000 MW by July 1982.

Vanderkloof power station

The first 110 MW generating set at this underground power station, which is situated at the P.K. le Roux Dam on the Orange River, was taken into commercial service in January 1977, having been commissioned in 1976. The second and last set was taken into commercial service in March 1977.

Both generating sets are operating satisfactorily and are controlled from the national control centre at Simmerpan near Germiston.

All construction work on the power station was completed by October 1977.

Koeberg power station

During the year satisfactory progress was maintained with the construction of the power station. The two sets of 922 MW capacity each are still scheduled for commissioning by the end of December 1982 and 1983 respectively.

Excavation of overburden to bedrock and refilling with soil cement were completed and construction of the lower foundation raft commenced.

A contract was placed during the year for the construction of breakwater arms to provide a stilling basin

for the abstraction of sea-water intended for cooling purposes. Construction work commenced.

Overseas manufacture of certain major components was started. Local manufacture of other components will enable South African industry to benefit from participation in construction involving new skills, techniques and requirements.

The Licensing Branch of the Atomic Energy Board, the statutory authority for nuclear safety, has kept a close watch on matters related to design work.

All major contracts have been placed, except for the construction of the high-voltage yard and cooling-water pumphouse.

Water Supply Projects

Usutu River Government Water Scheme

The section of this scheme designed to supply water to Camden power station and the first sets at Kriel power station, will be completed during 1978. At the end of 1977 only some plant commissioning, testing, repair and maintenance work was still outstanding. An extension of the above-mentioned section includes the supply of water to the balance of Kriel power station and one set at Matla power station.

Komati River Supply Scheme

This scheme supplies Komati, Hendrina and Arnot power stations and will also cater for part of the needs of Duvha power station. The final stage of installation of reserve pumping plant was undertaken, bringing the pumping scheme to completion. The extension of supply to Duvha power station is being undertaken by the Department of Water Affairs.

Steps towards environmental protection

Concern about environmental protection is growing and Escom is continually working on projects to restrict pollution to a minimum. Chimney emissions continued to constitute the most serious problem. As its share of controlling smoke emission dispersal, Escom is at present increasing the height of chimneys at power stations now under construction. The second of the two chimneys for Matla power station has consequently been raised some 60 m higher than the first. The reinforced concrete multi-flue chimney now under construction for Duvha power station will be 300 m high.

To control fly-ash emission at Duvha power station, electrostatic precipitation equipment, designed to comply with stringent dust emission standards, was ordered. Precipitator contracts for Kriel and Matla power stations were also awarded and at Taaibos and Highveld power stations precipitators are already being installed.

As far as urban substations are concerned, close co-operation with municipal authorities was maintained in the design of the new substations at Craighall (Johannesburg) and Sandpark (Sandton) for the Rand and Orange Free State Undertaking to ensure that there would be no adverse impact on the environment.

Transmission projects

In Cape Northern Undertaking a 400 kV line from Kenhardt to a major stepdown substation at Aggeneis has been completed. This substation will supply the copper/zinc/lead mines being established in the immediate vicinity and is also the start of a 220 kV network to feed the O'Okiep Copper Co. near Springbok and the De Beers diamond fields at Kleinsee and Oranjemund. Construction of this network is well advanced. Supplies from the substations nearing completion at Aggeneis, Springbok, Kleinsee and Alexander Bay will be available between February and May 1978.

Extension of the 275 kV network from the Sishen area down to the Orange River near Groblershoop to supply two traction stations on the Sishen-Saldanha railway line has been completed. Supply will be taken by the SAR early in 1978.

The remainder of the traction substations are to be fed from a 400 kV network emanating from the existing system at De Aar. Two substations on this network, one near Copperton and the other near Kenhardt, were recently commissioned.

The above-mentioned network expansion to supply areas as far as the West Coast and the Sishen-Saldanha iron ore export scheme involved the building of eleven 400 kV, 275 kV or 220 kV substations and 1 440 km of high-voltage transmission line. Construction work was completed in the relatively short time of three years.

In the Cape Western Undertaking there are two 400 kV substations which will supply the Sishen-Saldanha railway line. The northern one (Juno) near Vredendal is expected to be commissioned in May 1978, while the southern one (Aurora) near Langebaanweg was completed in December 1977.

The 400 kV transmission line from Muldersvlei substation to Aurora substation was completed during December.

The first of two 400 kV transmission lines linking Muldersvlei and Acacia substations was completed and energised in June, the necessary work at the substations having been completed earlier.

As part of the 400 kV reinforcement scheme to Richards Bay and the electrification of the SAR line from Eastern Transvaal to Richards Bay, construction is in hand for the 130 km long 400 kV line from Normandie substation near Piet Retief to Umfolozi substation near Babanango, and the 125 km long 400 kV line from Umfolozi to Invubu substation at Richards Bay.

At Richards Bay, Rabbit substation was completed to give a duplicate 275 kV supply to the Richards Bay Iron and Titanium Project. Two 275 kV lines, each 34 km in length, were constructed to Rabbit from Impala substation near Empangeni.

Design work continues for the interconnection of the Drakensberg Pumped Storage Scheme to the 400 kV system at Pegasus and Mersey substations, and survey work for both the 400 kV lines is almost complete.

In Rand and Orange Free State Undertaking priority was given to Craighall, the new 275/88 kV urban substation. Due to the limited space available special indoor switchgear, which occupies one tenth of the area required for conventional equipment, is being installed. Special attention was given to an aesthetic structure, to surroundings, and the suppression of noise. This substation is scheduled for completion towards the end of 1978, but difficulties in obtaining rights of way for the incoming lines, due to landowners' increasing resistance to the granting of wayleaves and servitudes for transmission lines, are likely to delay commissioning.

Work has also commenced on the establishment of a similar substation, Croydon, near Jan Smuts Airport to strengthen the supplies in the Germiston and Isando industrial areas. Here, indoor as well as some outdoor equipment is featured. Again, attention has been given to environmental aspects.

Minerva substation, at Knoppieslaagte near Verwoerdburg, is being established to receive 275 kV supplies from Apollo and to distribute 275 kV supplies to Kwagga (Pretoria West) and Craighall (Johannesburg City Council). Future planning for this station includes 400 kV supplies from Apollo and Vulcan, and the incorporation of the 400 kV Apollo-Pluto lines.

The uprating of the Esselen substation was completed during the year.

Strengthening of the East Rand system was effected by the establishment of Benburg substation, between Boksburg and Benoni, where one of the Esselen-Nevis 275 kV lines was turned into a 275/132 kV substation. The outgoing 132 kV lines are due for completion early in 1978.

The strengthening of supplies to the Nuffield industrial complex near Springs is being undertaken by the extension of the Nevis substation near Geduld.

To meet power requirements in the Sasolburg area a new substation, Makalu (275/88 kV), was established at Viljoensdrif in the Northern Free State obtaining 275 kV supplies from Atlas substation and Highveld power station. At the request of consumers this substation was commissioned two months ahead of schedule.

In Eastern Transvaal Undertaking a 275 kV line from Arnot power station to a new stepdown substation near Steelpoort was completed during the year and in

September the substation was brought into operation to strengthen the existing 132 kV network in the area and to give direct supply to the recently established Tubatse ferrochrome plant nearby.

In the second half of the year supply was made available to another new ferrochrome plant near Lydenburg. To facilitate this, Lydenburg substation underwent extensive modification and an additional 132 kV line was brought into the substation from the Middelburg area.

The main substation supplying the Phalaborwa area was strengthened by a 275 kV link from Acornhoek which now operates in parallel with the existing three 132 kV lines and a fourth 132 kV traction line recently completed.

Construction work has started on two major 400 kV substations, one to feed the 88 kV Richards Bay traction line and strengthen the local 88 kV system near Moolman and the other to provide a 500 MVA supply at 132 kV to the Sasol II complex near Trichardt. Both these substations are scheduled for completion early in 1979. Associated with these substations is the construction of several important 400 kV transmission lines. A start has been made on two of these, one between Camden power station and Moolman, which will eventually connect with the Natal Undertaking nearby, and one between Kriel power station and Grootvlei power station via the Sasol II complex.

In Border Undertaking construction work is in hand for completion in May 1978 of the 132 kV yard at Pembroke and the installation of the two 220/132 kV 250 MVA transformers. This will strengthen the interconnection of Port Rex gas-turbine power station to the system.

In Orange River Undertaking work revolved mainly round Hydra substation situated near De Aar. Here the 400 kV yard was considerably extended and a 400 kV feeder bay was commissioned for the line to Kronos.

Construction work is well advanced for completion of the third 400 kV line (284 km in length) from Perseus to Hydra in April 1978, a 400 kV series capacitor bank on this line at Luckhoff, and a 400 kV feeder bay at Hydra substation.

This line will strengthen supplies to the Cape as well as major extensions throughout Northern Cape.

Ancillary civil works, facilities

During the past year the provision of housing and communal amenities for both Escom and contractor staff has increased commensurate with Escom's expansion programme.

In all 1 600 permanent and temporary houses, flats, single-quarters, recreation halls and other township buildings were erected, mostly at power stations. At Kriel township the delivery of permanent houses was at a rate of roughly four units per working-day.

A comprehensive programme to improve existing hostels for Blacks was started. These, designed to new architectural and living standards, were built at some of the older power stations and substations. A significant development has been the purchasing of accommodation, for married and single personnel, in Black townships where these are conveniently situated to places of work.

Lecture rooms, hostels and other facilities were erected for the Education Department at its various centres. The first training centre for Black students, with housing for married staff, single staff and students, was established at Sebokeng township near Vereeniging.

The completion and occupation of the new Head Office complex, Megawatt Park, was a significant milestone in the year, providing a single home for Head Office staff after the years spent dispersed throughout Braamfontein.

Ancillary electrical projects

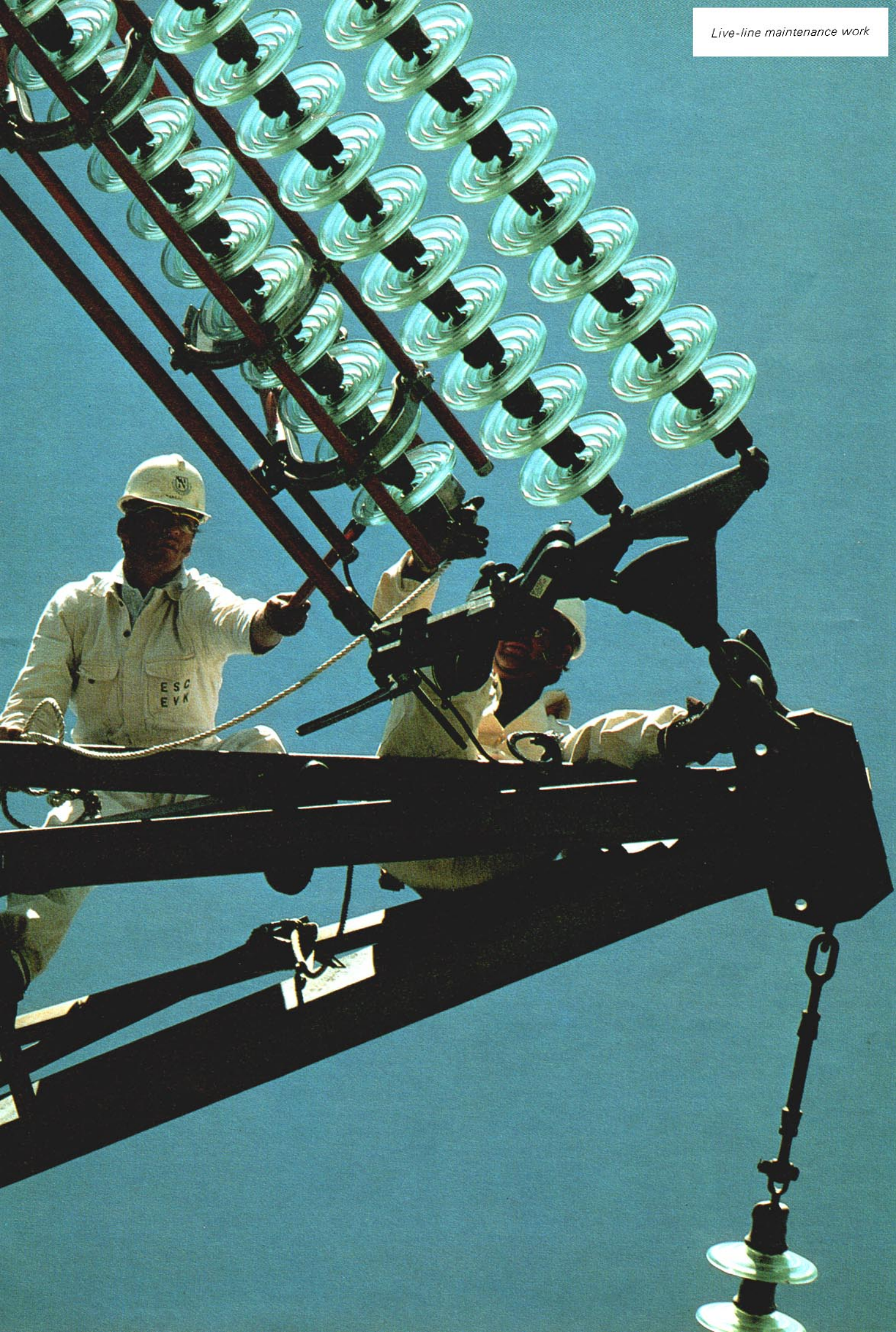
To improve the environmental impact of substations in populated or scenic areas and to minimise the risk of faults and consequently interruption of supplies due to atmospheric pollution, increasing application is being made of high-voltage switchgear installations using the new SF_6 gas-insulated metalclad technique. A number of such installations are now being engineered and will be due for completion from 1978 onwards. These include Craighall and Croydon (Rand and OFS Undertaking), Invubu and Drakensberg (Natal Undertaking), and Koeberg (Cape Western Undertaking). The SF_6 gas-insulated technique will be used for the first time in a medium-voltage application in the form of 6,6 kV, 50 kA switchgear at Koeberg power station where safety aspects are paramount.

Notable power transformer installations during the year include a locally manufactured 18/420 kV 560 MVA generator transformer for Kriel power station, the first generator transformer on the Escom system provided with on-load tapchanging to facilitate MVAr control.

Protection of electrical networks

Continuous efforts are being made to increase the reliability and continuity of power supply by improving the speed and performance of network protection. To ensure that the protection will perform correctly, special fault throwing tests have been conducted on the 400 kV lines to the Cape, the 400 kV line to Port Elizabeth and East London, and the 275 kV line feeding Northern Transvaal. During these tests, faults, i.e. short circuits, are artificially created on the lines under controlled conditions. In this way difficulties with the relaying and communication systems can be detected and corrected before they result in protracted supply interruptions.

Such tests are also used to examine the performance of fault locators so trouble spots can be located rapidly and accurately.



Live-line maintenance work

National and regional communication and control

Substantial progress was made with Escom's national microwave network. The sections between Simmerpan and Hydra and Simmerpan and Grootvlei were commissioned in July 1977, and the section Simmerpan-Georgedale during December 1977.

Since most major substations are connected to the microwave network it is now possible to provide teleprotection signalling for 400 kV lines as an alternative to power-line carrier protection.

The coverage of the licensed supply areas by mobile radio is being gradually expanded, some 1 500 are currently in operation.

The radio room in the new national communications and control building at Simmerpan has been taken into use. An on-line data logger provides information of all alarms occurring on the microwave network, with printer and cathode ray tube display.

A country-wide trunk telephone switching network to improve long distance communication is presently being completed.

Electrical and mechanical research

During 1977 the research divisions continued investigating problems in the generation, transmission and distribution fields and their environmental impacts.

On the electrical side, methods for improving the reliability of supplies have received increasing attention. Earth resistivity surveys and earthmat designs have been carried out for a number of substations. Radio interference from a 275 kV line in the Kimberley area is being monitored to assist with the new metric designs.

Pollution and the correct application of insulators have received extensive attention. A 10 km long experimental 11 kV woodpole line is to be constructed so that the influence of lightning on rural supplies may be better understood. This project is being undertaken in co-operation with the CSIR.

On the mechanical research side, problems from existing

plant as well as problems arising from the design of new plant were investigated, with the emphasis on the latter. On existing plant, projects such as mill vibration, plant noise, waterhammer, structural analysis, and sulphur dioxide measurement in combustion gases have been investigated successfully. Regarding future stations, projects have included research into further hydraulic aspects of the Drakensberg Pumped Storage Scheme, wind-tunnel studies of the Duvha multi-flue chimneys and of the forces on microwave dishes, and an investigation into the cooling-water outfall for Koeberg nuclear power station. Activities in the field of air-pollution control have increased on both a theoretical and experimental front with the development of a computer model of Eastern Transvaal and the specification of mobile field monitoring units.

Appropriate contacts with other organisations such as the CSIR, SABS, the Department of Water Affairs and the universities have been maintained through joint projects and by representation on committees.

Quality assurance

During the latter half of 1976 a Quality Assurance Department was formed so as to ensure that Koeberg nuclear power station would be built to the required high standards. This department performs its functions in Johannesburg, at the Koeberg site and in Paris, and during 1977 it prepared and implemented the required quality assurance plans, programmes and procedures.

Most of the year's work pertained to civil works, although certain long lead time items such as the reactor pressure vessel were also checked.

As quality assurance is a new field in South Africa, consultants were appointed to assist with the establishment of this department. Members of the consortium also have their own quality assurance arrangements which are monitored by Escom, while the Atomic Energy Board and the consultants' principals monitored the Escom programme.

Personnel

During the year under review Escom's total employee complement increased by 6,0 per cent (8,6 per cent in 1976).

Table 15

	1976	% increase during 1976	1977	% increase during 1977
White salaried employees	7 822	9,9	8 442	7,9
White monthly-paid employees	5 681	7,6	5 914	4,1
Non-white employees	23 412	8,4	24 756	5,7
Total	36 915	8,6	39 112	6,0

The 6,0 per cent increase in 1977 was necessary mainly for the construction, commissioning and operation of new and additional plant at Kriel, Matla, Duvha, Koeberg, Vanderkloof and Drakensberg power stations, and the expansion of distribution networks by the various Undertakings.

Recruitment campaigns were conducted locally and in the United Kingdom where 33 offers of employment were made to candidates with special skills. Fifteen accepted: this low acceptance rate can be attributed to the adverse publicity South Africa is receiving overseas.

Between July and September 1977, 1 640 Head Office employees (excluding those of Education Department who are based at Sable Centre in Braamfontein) were relocated in Escom's new Head Office complex at Megawatt Park in Sandton. Employees reacted favourably to their new environment and indications are that staff morale has improved.

Education and training

Educational activities increased steadily in 1977 and 7 800 course registrations took place (6 800 in 1976). During the year 135 university students studied with Escom bursaries (143 in the previous year). The number of pupil technicians increased from 310 to 380 and the apprentices from 430 to 488.

Education Department was reorganised with effect from March 1977. One of the features is a stronger emphasis on training within the Undertakings which will enable Escom to economise by avoiding the transport of employees from all over the country to a central training centre. The first home-study courses for Escom power-station personnel were instituted on a trial basis.

An extensive training programme was started for Koeberg personnel, and by the end of 1977 30 employees were involved in this project. In October three specialists from the USA conducted a short nuclear familiarisation course for 60 of Escom's senior staff.

Reaction to the management training programme was favourable. Some of the 60 participants in this programme for management had completed their training by the year's end. Investigations are under way to extend the training to middle management.

Installation of the new ICL computer equipment at Education Department's Head Office progressed rapidly and a programme for training computer operators and data entry clerks was launched.

Planned extensions to facilities at Henley, Meyerton and Sebokeng for operating maintenance and Black employees have reached the final stages.

Amenities, sport and recreation

Escom provides sport and recreation facilities for employees at its various power stations, distribution undertakings and at Head Office. There are 24 sports clubs which have a total membership of 20 154 (14 400 in 1976).

During 1977 the Escom Club (Drakensberg) was established to cater for employees working on the Drakensberg Pumped Storage Scheme, while the Escom Club (Johannesburg) was relocated at Megawatt Park.

Non-white sport and recreation, particularly soccer and tribal dancing, continued to increase in popularity under the auspices of the Escom clubs.

Personnel relations

In general good labour relations were maintained during the year under review.

As a result of the present economic climate Escom adopted the practice of other major organisations and granted smaller increases in salaries and wages in 1977. This however, resulted in some employee dissatisfaction and the trade unions declaring a dispute with Escom. Through negotiations the matter was satisfactorily resolved.

Commissions of inquiry into labour matters

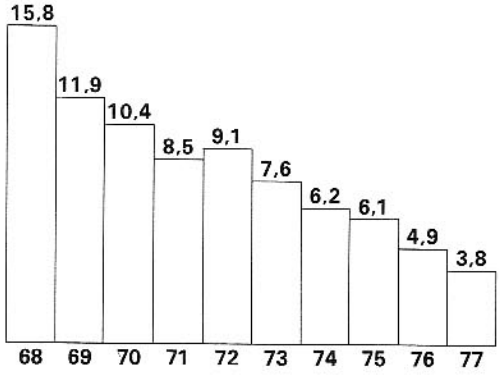
Escom submitted representations to the two commissions of inquiry established to investigate labour legislation and labour usage, viz. the Commission of Inquiry into Labour Legislation (Wiehahn Commission) and the Commission of Inquiry into Legislation Affecting the Utilisation of Manpower (Riekert Commission).

Prevention of accidents

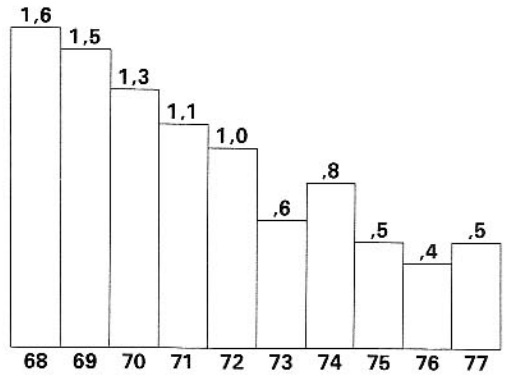
The accident prevention programme is making remarkable progress. As illustrated in the diagrams below, the number of disabling injuries and fatalities arising from work injuries is amongst the lowest experienced in the past ten years.

Megawatt Park, Escom's new headquarters in Sandton

Number of disabling injuries per million man-hours worked.



Number of fatal accidents per five million man-hours worked.



Financial

Capital expenditure

During 1977 expenditure amounting to R982 792 000 (1976: R642 639 000) was incurred on the Capital Account. This had the effect of increasing total capital expenditure to R4 192 918 000 after a deduction of R1 135 000 in respect of the cost of assets scrapped. Of total capital expenditure, some 32 per cent was in respect of works still in various stages of construction. This is a material increase over the corresponding value of 28 per cent as at 31 December 1976. It is expected that this proportion will increase further during 1978 and in future.

It is important that work under construction be covered by finance of a long-term nature as far as possible. With the uncertainties associated with financial markets Escom had to take steps to increase its internal finance to ensure that long-term finance would be available in sufficient quantities in 1977 and the future.

Internal financing

During 1977 the composition of the financing utilised by Escom changed considerably. Whereas in 1976 60 per cent of the gross finance required was raised from foreign sources, 26 per cent from South African investors and only 14 per cent via internal finance, in 1977 foreign sources provided 21 per cent, South African investors 50 per cent and internal financing 29 per cent. The dependence on external finance was thus reduced in 1977 primarily due to the changes in the Electricity Act of 1958 enacted in 1977.

Prior to 1977 the limitation on the amounts set aside to the Reserve Fund and the Capital Development Fund was prescribed in Section 13(2) of the Electricity Act of 1958, which provided that the maximum amount that could be set aside to the Capital Development Fund and the Reserve Fund was limited to 3% of unredeemed loans at the end of the year and the upper limit of the sum of contributions to the Capital Development Fund was set at 15% of unredeemed loans. These ceilings on internal financing were raised in terms of the Electricity Amendment Act 1977, promulgated on 6 July 1977, by which Escom is now empowered to –

1. raise the aggregate of the annual amounts set aside and paid into the Capital Development Fund and the Reserve Fund to 6% (previously 3%) of unredeemed loans; and
2. raise the upper limit of the sum of contributions paid into the Capital Development Fund by virtue of the amounts set aside under (1) above to 30% (previously 15%) of unredeemed loans.

The effect of this legislation is that Escom is now able to accelerate the generation of internal finance. The Capital Development Fund is thus able to contribute substantially towards overcoming the problems engendered by the difficulty currently being experienced in obtaining sufficient long-term finance on the capital market.

The amounts set aside to the Capital Development Fund since it was established in 1972 are given below –

	Rand million
1972	13,6
1973	15,4
1974	28,1
1975	40,7
1976	53,6
1977	224,0
	375,4

The 1977 tariff levels were brought into line with the new Capital Development Fund limits and the tariffs announced for 1978 provide for contributions at the maximum rate.

Loans and the capital markets

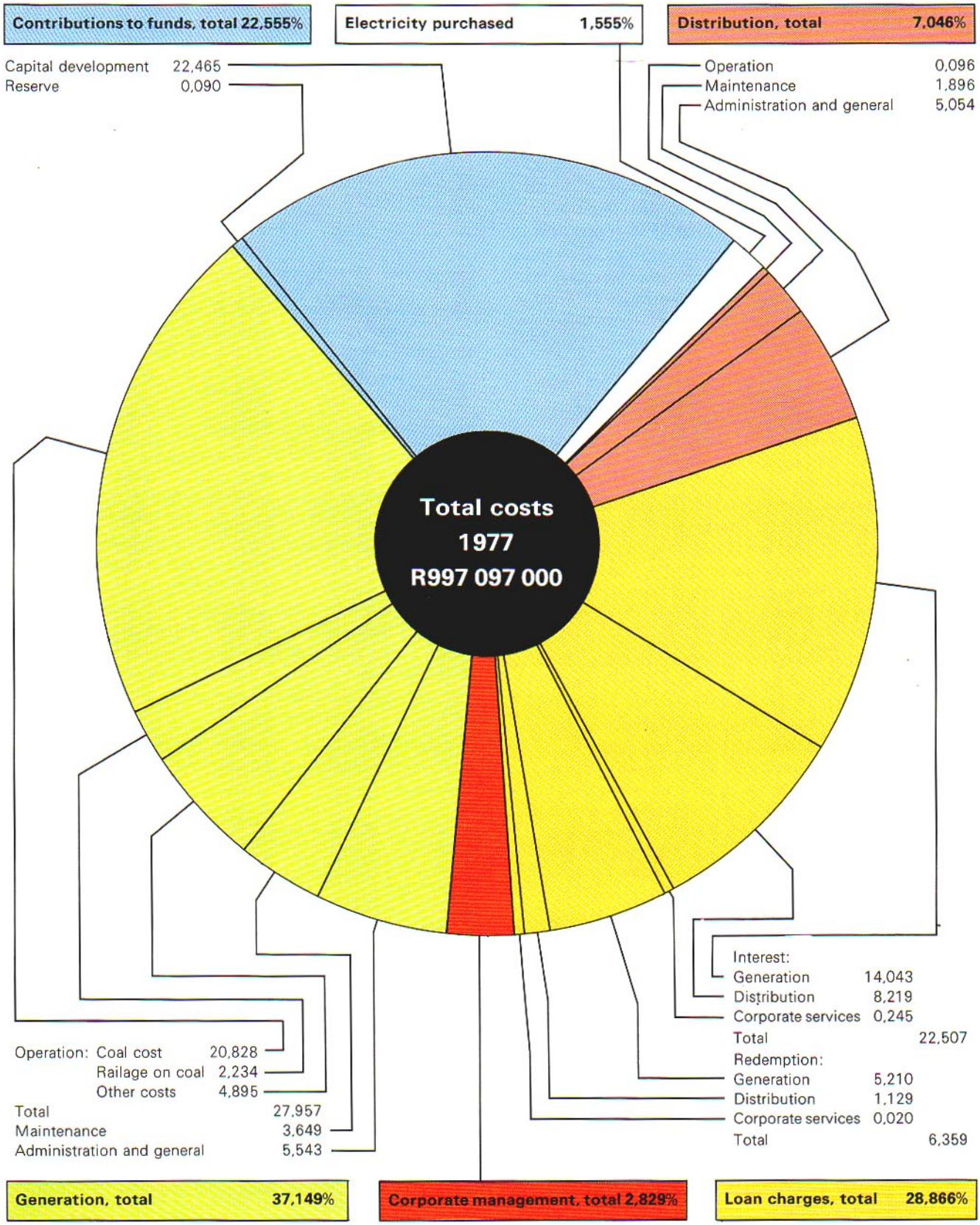
The adverse conditions on foreign capital markets anticipated in the 1976 report materialised. Foreign sources of finance provided R286,3 million in 1977 (R500,0 million in 1976) of which R139,9 million was Import Financing.

Fortunately conditions on the local capital market improved substantially during 1977. Loan issues in April and October raised R131,3 million from South African investors. There was also a substantial demand for Escom Internally Registered Stock on the secondary market. The support from these two local sources, together with the increased resources of the Capital Development Fund, was sufficient to offset the lower availability of foreign capital.

The nominal value of the finance obtained from the financial markets during the year ended 31 December 1977 is as follows:

	Rand million		
	Total	Local	Foreign
Internal registered stocks	542,7	542,7	
Acceptance credits	27,0	27,0	
Direct placements	112,4		112,4
Import financing facilities	139,9		139,9
Foreign payment financing	17,4		17,4
Other short-term borrowing	185,6	169,0	16,6
	1 025,0	738,7	286,3

It is hoped that the same degree of financing such as was obtained in 1977 from the local market will be provided to Escom in 1978. Escom is optimistic that foreign sources will provide a greater amount of financing in 1978 than that provided in 1977.


Contributions to funds, total 22,555%
Capital development 22,465
Reserve 0,090
Electricity purchased 1,555%
Distribution, total 7,046%
Operation 0,096
Maintenance 1,896
Administration and general 5,054
Total costs
1977
R997 097 000
Interest:
Generation 14,043
Distribution 8,219
Corporate services 0,245
Total 22,507
Redemption:
Generation 5,210
Distribution 1,129
Corporate services 0,020
Total 6,359
Operation: Coal cost 20,828
Railage on coal 2,234
Other costs 4,895
Total 27,957
Maintenance 3,649
Administration and general 5,543
Generation, total 37,149%
Corporate management, total 2,829%
Loan charges, total 28,866%

Capital Development Fund

Contributions amounting to R224,0 million (1976: R53,6 million) were made to the Capital Development Fund during 1977. The impact of increasing the contribution by a factor of 4,2 had the beneficial effect of Escom lessening its external borrowing requirement. Contributions in 1978 will be maintained at the new statutorily permitted levels. Interest which accrued to the Fund amounted to R33,2 million (1976: R15,1 million). In total the Capital Development Fund provided R257,2 million (1976: R68,7 million) as internal finance during 1977.

The amount standing to the credit of the Fund at 31 December 1977 was R438,8 million (1976: R181,6 million).

Reserve Fund

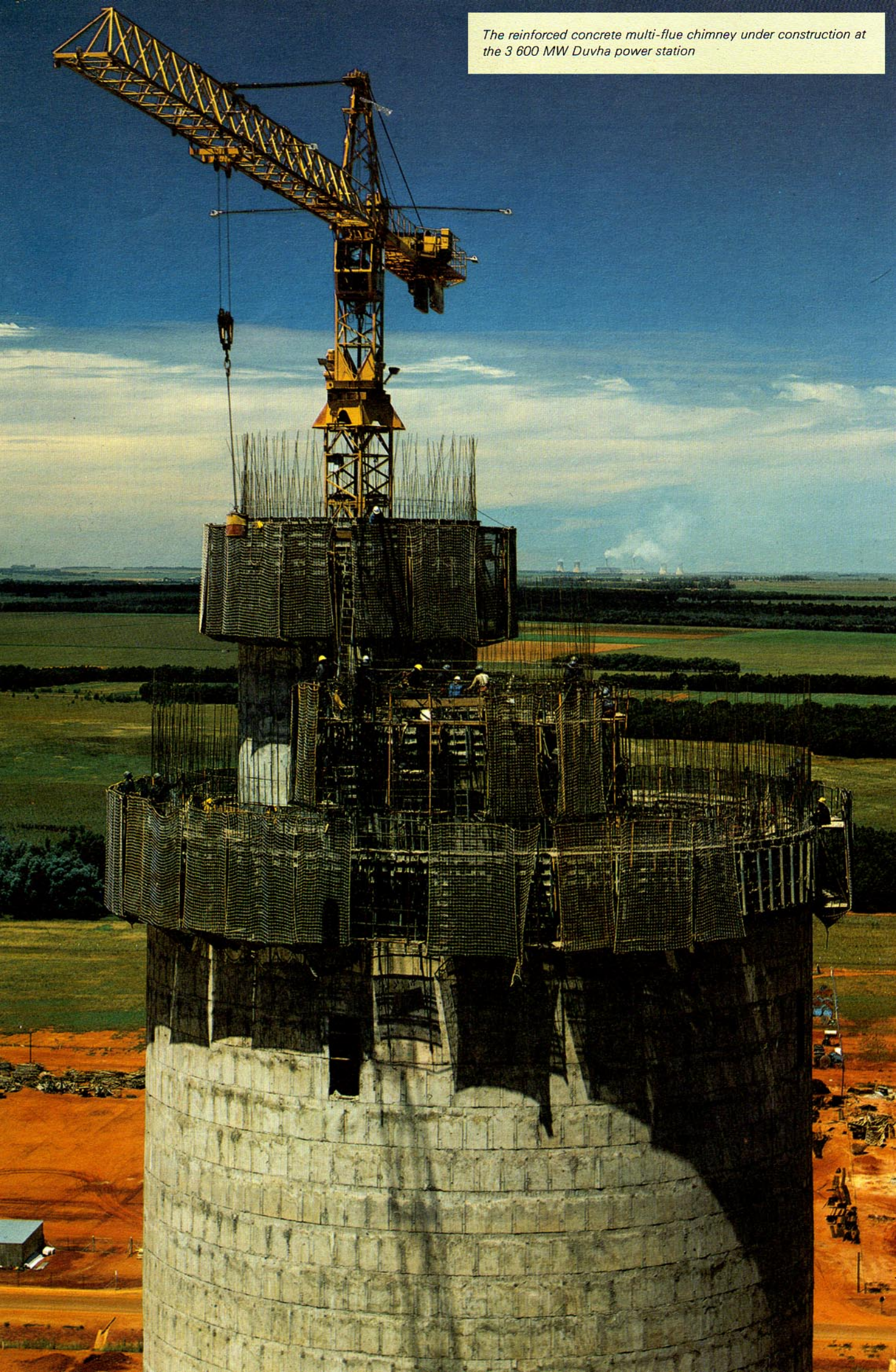
The Reserve Fund received contributions of R0,9 million during the year.

Replacement and betterment expenditure amounted to R4,2 million (1976: R4,3 million) while interest earned came to R15,8 million (1976: R14,3 million). The balance in the Fund at the end of the year was R209,1 million, an increase of R13,2 million over the preceding year.

Electricity Supply Account

Total revenue from electricity sales in 1977 was R1 030,6 million which represented an increase of R374,2 million (57 per cent) above the previous year.

Operating costs (loan charges and fund contributions excluded) rose to R484,4 million, an increase of 25,6 per cent. After loan charges and fund contributions were deducted from revenue minus costs, a surplus of R33,5 million remained which enabled the accumulated deficit of R39,0 million at the end of 1976 to be reduced to R5,5 million at the end of 1977.



The reinforced concrete multi-flue chimney under construction at the 3 600 MW Duvha power station

The report of the auditors

The Chairman and Members
Electricity Supply Commission
Sandton

We have examined the financial statements of the Commission for the year ended 31 December 1977 and schedules 1 to 9, as set out on pages 39 to 54 and report as follows:

(a) The financial statements of the Commission are in order and present the information required by the Electricity Act, 1958 (the Act).

(b) Due provision in terms of the Act, has been made for the redemption and repayment of monies borrowed by or advanced to the Commission.

(c) Sums fixed by the Commission have been set aside to the Reserve Fund and Capital Development Fund under section 13 of the Act.

(d) All our requirements as auditors have been complied with and carried out.

(e) Net expenditure under the heading Corporate Services has been allocated by the Commission to Capital and Reserve Fund expenditure and Electricity Supply Account of Undertakings. We have no reason to disagree with the apportionment so made.

In our opinion the financial statements fairly present the financial position of the Commission at 31 December 1977 and the results of its operations for the year ended on that date and the schedules present fairly the information set forth therein.

Halsey, Button & Perry
Alex. Aiken & Carter
Chartered Accountants (S.A.), Auditors

Johannesburg
23 March 1978

Balance sheet

at 31 December 1977

	Notes	R000		R000	1976
Capital expenditure, at cost	3		**4 192 918**		3 211 261
Land and rights		**50 101**		33 372	
Buildings and facilities		**226 892**		136 470	
Production plant		**2 574 110**		2 141 883	
Total in commission		**2 851 103**		2 311 725	
Works under construction		**1 341 815**		899 536	
Equipment and stores			**226 223**		184 774
Movable plant and equipment, at cost		**65 806**		54 833	
less Accumulated depreciation		**31 587**		23 637	
		34 219		31 196	
Stores and materials	4	**192 004**		153 578	
External investments	5		**40 275**		38 366
Deferred expenditure	6		**84 997**		65 014
			4 544 413		3 499 415
Financed by					
External borrowings			**3 007 506**		2 309 584
Loans outstanding (Schedule 1)	7	**2 778 799**		1 998 646	
less Escom stock held internally	8	**961 089**		709 031	
		1 817 710		1 289 615	
Import financing facilities	7	**251 000**		128 473	
Other short-term loans and advances (Schedule 2)	7	**938 796**		891 496	
Net current liabilities			**111 755**		125 771
Current liabilities and provisions			**286 359**		206 420
Accounts payable		**184 885**		112 337	
Sundry provisions		**19 141**		16 656	
Interest accrued		**68 735**		42 452	
Bank overdrafts		**13 598**		34 975	
Current assets			**174 604**		80 649
Accounts receivable		**111 874**		75 134	
Payments in advance		**2 296**		2 662	
Funds at call	9	**53 871**		—	
Bank balances and cash		**6 563**		2 853	
Total net debt			**3 119 261**		2 435 355
Statutory funds, reserves and provisions			**1 425 152**		1 064 060
Capital Development Fund	10	**435 154**		181 601	
Reserve Fund	10	**199 373**		195 861	
Redemption Fund	10	**359 336**		325 683	
Unrealised surplus on Escom stock held internally	8	**31 730**		27 861	
Provision for repayment of foreign loans		**42 919**		22 118	
Capital reserve	11	**362 187**		349 938	
		1 430 699		1 103 062	
less Accumulated deficit	12	**5 547**		39 002	
			4 544 413		3 499 415

Electricity supply account

for the year ended 31 December 1977

R000

1976 Total		Notes	1977 Total	Corporate Services	Central Generating	Distribution Undertakings Total	Cape Western	Cape Northern	Cape Eastern	Border	Orange River	Natal	Eastern Transvaal	Rand and O.F.S.
656 381	**Electricity sold**	13	**1 030 552**	—	—	**1 030 552**	**111 984**	**34 922**	**1 094**	**21 199**	**14 163**	**200 143**	**126 881**	**520 166**
385 739	**Operating expenditure**	14	**484 376**	**28 210**	**385 806**	**70 360**	**13 294**	**4 356**	**420**	**3 440**	**2 218**	**12 440**	**9 201**	**24 991**
215 299	**Loan charges**	15	**287 821**	**2 642**	**191 970**	**93 209**	**11 917**	**7 305**	**246**	**2 932**	**3 570**	**12 870**	**14 649**	**39 720**
55 284	**Contributions to funds**	16	**224 900**	—	—	**224 900**	**16 690**	**5 670**	**60**	**2 660**	**3 580**	**36 680**	**31 160**	**128 400**
—	**Distribution of costs**	17	—	**(30 852)**	**(577 776)**	**608 628**	**59 098**	**17 685**	**264**	**9 846**	**8 485**	**101 917**	**76 271**	**335 062**
656 322			**997 097**	—	—	**997 097**	**100 999**	**35 016**	**990**	**18 878**	**17 853**	**163 907**	**131 281**	**528 173**
(59)	**(Surplus)/deficit for the year**		**(33 455)**	—	—	**(33 455)**	**(10 985)**	**94**	**(104)**	**(2 321)**	**3 690**	**(36 236)**	**4 400**	**8 007**
(16)	**Surplus on network taken over**		—	—	—	—	—	—	—	—	—	—	—	—
39 077	**Accumulated (surplus)/deficit at beginning of year**		**39 002**	—	—	**39 002**	**5 535**	**2 035**	**349**	**2 036**	**3 668**	**(239)**	**1 060**	**24 558**
39 002	**Accumulated (surplus)/deficit at end of year**		**5 547**	—	—	**5 547**	**(5 450)**	**2 129**	**245**	**(285)**	**7 358**	**(36 475)**	**5 460**	**32 565**

R000

1976 Corporate Services	Central Generating	Distribution Undertakings Total	Cape Western	Cape Northern	Cape Eastern	Border	Orange River	Natal	Eastern Transvaal	Rand and O.F.S.
—	—	656 381	73 195	21 756	624	14 035	9 749	121 499	78 337	337 186
14 100	311 594	60 045	11 285	3 528	296	2 656	1 504	11 220	7 269	22 287
387	141 815	73 097	8 699	4 511	179	2 008	2 655	11 879	10 662	32 504
—	35 372	19 912	2 178	1 053	35	617	755	3 480	2 937	8 857
(14 487)	(488 781)	503 268	50 941	13 425	122	9 327	7 328	86 730	56 566	278 829
—	—	656 322	73 103	22 517	632	14 608	12 242	113 309	77 434	342 477
—	—	(59)	(92)	761	8	573	2 493	(8 190)	(903)	5 291
—	—	(16)	—	—	—	—	(16)	—	—	—
—	—	39 077	5 627	1 274	341	1 463	1 191	7 951	1 963	19 267
—	—	39 002	5 535	2 035	349	2 036	3 668	(239)	1 060	24 558

Notes to the financial statements

at 31 December 1977

1. Accounting policies

The principal accounting policies adopted by the Commission are as follows:

Capital expenditure and equipment

Interest is added to the cost of capital works under construction until such assets are taken into commercial operation.

Capital expenditure is not depreciated but is maintained at cost while the relevant assets are in commercial operation. Charges are made to operating expenditure to provide for the repayment of loans. (See amortisation of borrowings.)

Movable plant and equipment is depreciated at rates considered appropriate to reduce cost to estimated residual value over the useful lives of the assets.

Stores and materials

Stores and materials are valued at the lower of cost, determined on the last-in-first-out basis, and replacement value.

Foreign currencies

Foreign currency liabilities covered by forward exchange contracts are translated to Rand at the protected rates of exchange. Liabilities not covered by forward exchange contracts and foreign assets are translated to Rand at the rates of exchange ruling at the balance sheet date. The currencies most favourable to the bondholders are used to translate loans raised in European Units of Account.

Deferred expenditure

Discount on loans issued is charged to costs over the remaining periods of the related loans.

Net losses arising from the translation of foreign long term loan balances at the rates of exchange ruling at the balance sheet date are written off over the remaining periods of the loans.

Amortisation of borrowings

A redemption fund is established in terms of the Electricity Act, 1958 and provision for the redemption of loans is made over periods not exceeding 25 years.

The State President, in terms of Section 10(2) of the Act, has directed that the provisions relating to the establishment of the redemption fund should not apply to foreign loans; provision for repayment of such loans is made over periods not exceeding 25 years.

The redemption fund provisions are not applied to short-term loans and advances, as these are made under the provisions of paragraph 1(3) of the Schedule to the Act in anticipation of the raising of loans.

Operating revenue and expenses

Meters are read on a cyclical basis and sales of electricity are accounted for concurrently. The revenue related to supplies between the date of the last reading and the end of the accounting period is not included in sales, whereas the related expenses are charged as incurred.

2. Change in basis of accounting

Effective 1 January 1977, the basis of valuing stores and materials was changed from average cost to the lower of cost, determined on the last-in-first-out (LIFO) basis, and replacement value.

The LIFO basis has been adopted to provide a more realistic matching of current costs and revenue. The effect of the change was to increase operating expenditure by approximately R10 million.

R000

	1977	1976
3. Capital expenditure		
Balance at beginning of year	**3 211 261**	2 569 803
Assets decommissioned, sold or scrapped	**1 135**	1 181
	3 210 126	2 568 622
Expenditure during the year	**982 792**	642 639
Balance at end of year	**4 192 918**	3 211 261
Commitments in respect of capital expenditure contracted for amount to approximately	**2 042 000**	2 169 000
This expenditure will be financed from external borrowings and from cash generated by means of the Capital Development Fund		
4. Stores and materials		
Consists of		
Gas/Oil	**182**	221
Coal	**26 352**	14 084
Construction material	**107 180**	85 452
Maintenance and consumable stores	**58 290**	53 821
	192 004	153 578
5. External investments		
Held for		
Reserve Fund (Schedule 4)	**9 187**	9 422
Redemption Fund (Schedule 5)	**1 451**	2 147
	10 638	11 569
Housing loans to employees secured by first mortgage	**29 636**	26 796
Entire share capital of Rand Mines Power Supply Company Limited	**1**	1
	40 275	38 366
6. Deferred expenditure		
Discount on loans issued	**44 314**	33 000
Exchange adjustment of foreign liabilities	**18 812**	15 690
Expenditure to secure future fuel supplies	**21 871**	16 324
	84 997	65 014
7. External borrowings		
The current portion of external borrowings (excluding revolving credits) amounts to	**313 824**	244 137
Of this amount the portion provided for through the Redemption Fund and the provision for repayment of foreign loans is	**28 492**	17 838

Borrowings in the following currencies are not covered by forward exchange contracts

	1977	1976
European Units of Account	**16 857 000**	20 967 000
Deutsche Mark	**1 028 000**	1 030 000
Maltese Pounds	**5 000 000**	5 000 000

8. Escom stock held for	Schedule	Book Value	Nominal Value	Book Value	Nominal Value
Capital Development Fund	3	**426 320**	**434 510**	175 409	177 161
Reserve Fund	4	**185 907**	**193 860**	183 881	193 033
Redemption Fund	5	**310 338**	**324 847**	317 184	333 173
Repayment of foreign loans	6	**6 794**	**7 872**	4 696	5 664
		929 359	**961 089**	681 170	709 031
Unrealised surplus being excess of nominal over book value			**31 730**		27 861

R000

	1977	1976
9. Funds at call		
Held for Redemption Fund (Schedule 5)	**42 500**	—
Other	**11 371**	—
	53 871	—

10. Statutory funds

The accounting policies adopted provide for annual contributions to be made to the Funds, together with additional contributions, if necessary, to maintain the Redemption Fund in accordance with statutory requirements.

During 1977 extensive dealings in Escom Stock held as investments for the Funds, at prices based on interest pattern rates above coupon rates, resulted in certain stocks being sold at less than book value. In previous years the results of such transactions were immediately recognised in the Fund accounts. If this practice had continued, borrowings would be over-amortised due to the additional contributions necessary to maintain the Redemption Fund at the minimum statutory level.

The Commission has therefore decided to set off the difference on the stock transactions against the higher future interest earnings on the re-invested proceeds, that are sufficient to meet such charges, over the period to maturity of the original investment, for all statutory funds. To the extent that the difference has been deferred, the amounts available for investment are reduced as follows:

Capital Development Fund (Schedule 7)	**438 830**	181 601
Difference between book value and proceeds of stock sold	**3 676**	—
	435 154	181 601
Reserve Fund (Schedule 8)	**209 074**	195 861
Difference between book value and proceeds of stock sold	**9 701**	—
	199 373	195 861
Redemption Fund (Schedule 9)	**382 566**	325 683
Difference between book value and proceeds of stock sold	**23 230**	—
	359 336	325 683

11. Capital reserve

Loans repaid	**413 828**	400 444
Machinery and plant financed from Reserve Fund	**10 360**	10 360
	424 188	410 804
less Cost of land and rights, buildings and facilities and production plant scrapped	**62 001**	60 866
	362 187	349 938

12. Accumulated deficit

In terms of the Electricity Act, 1958, the undertakings of the Commission are, as far as practicable, carried on at neither a profit nor at a loss and its charges are adjusted accordingly from time to time.

13 to 17. Electricity Supply Account – see pages 44/45.

18. Commitments

The Commission is committed for

1. The payment of approximately R1 795 000 (1976: R1 442 000) in respect of loans granted to employees under the Commission's Home Ownership Scheme.
2. The payment to the Electricity Supply Commission Pension and Provident Fund, in addition to the normal contributions, of R191 000 per annum until 1985.
3. The purchase from certain stockholders of Electricity Supply Commission Local Registered Stock as follows:
   R4 500 000 – 6 75 per cent 1991 not later than September 1978 at R97 per cent.
   R2 000 000 – 6,75 per cent 1991 at the option of the stockholders at R97 per cent.

19. Contingent liabilities

The Commission has indemnified the Electricity Supply Commission Pension and Provident Fund against any loss resulting from the negligence, dishonesty or fraud of the Fund's officers or of the Trustees.

Electricity Supply Account

R000

1976 Total	Note		1977 Total	Corporate Services	Central Generating	Distribution Undertakings Total	Cape Western	Cape Northern	Cape Eastern	Border	Orange River	Natal	Eastern Transvaal	Rand and O.F.S.
656 381	13	**Electricity sold**				**1 030 552**	**111 984**	**34 922**	**1 094**	**21 199**	**14 163**	**200 143**	**126 881**	**520 166**
212 253		Industrial				**336 967**	**40 045**	**3 377**	**521**	**2 293**	**910**	**64 095**	**75 663**	**150 063**
211 595		Bulk				**329 176**	**44 123**	**7 022**	**222**	**17 391**	**13 181**	**101 948**	**13 084**	**132 205**
163 580		Mining				**260 709**	**—**	**17 448**	**—**	**—**	**—**	**5 280**	**29 199**	**208 782**
46 089		Traction				**70 294**	**11 307**	**6 140**	**—**	**—**	**—**	**23 809**	**8 204**	**20 834**
22 864		Domestic and lighting				**33 406**	**16 509**	**935**	**351**	**1 515**	**72**	**5 011**	**731**	**8 282**
385 739	14	**Operating expenditure**	**484 376**	**28 210**	**385 806**	**70 360**	**13 294**	**4 356**	**420**	**3 440**	**2 218**	**12 440**	**9 201**	**24 991**
238 794		Operations	**280 193**	**318**	**278 754**	**1 121**	**115**	**69**	**—**	**38**	**186**	**172**	**172**	**369**
51 711		Maintenance	**55 188**	**63**	**36 387**	**18 738**	**3 819**	**583**	**144**	**987**	**523**	**2 867**	**3 439**	**6 376**
2 399		Electricity purchased	**15 501**	**—**	**15 392**	**109**	**—**	**—**	**102**	**—**	**7**	**—**	**—**	**—**
92 835		Administration and general expenses	**133 494**	**27 829**	**55 273**	**50 392**	**9 360**	**3 704**	**174**	**2 415**	**1 502**	**9 401**	**5 590**	**18 246**
215 299	15	**Loan charges**	**287 821**	**2 642**	**191 970**	**93 209**	**11 917**	**7 305**	**246**	**2 932**	**3 570**	**12 870**	**14 649**	**39 720**
173 832		Interest and finance charges	**224 418**	**2 446**	**140 021**	**81 951**	**10 506**	**6 602**	**222**	**2 670**	**3 153**	**11 000**	**12 947**	**34 851**
20 167		Redemption of local loans	**24 842**	**196**	**13 538**	**11 108**	**1 411**	**703**	**24**	**262**	**417**	**1 720**	**1 702**	**4 869**
21 300		Repayment of foreign loans	**38 561**	**—**	**38 411**	**150**	**—**	**—**	**—**	**—**	**—**	**150**	**—**	**—**
55 284	16	**Contributions to funds**	**224 900**	**—**	**—**	**224 900**	**16 690**	**5 670**	**60**	**2 660**	**3 580**	**36 680**	**31 160**	**128 400**
1 700		Reserve Fund	**900**	**—**	**—**	**900**	**—**	**—**	**—**	**200**	**200**	**500**	**—**	**—**
53 584		Capital Development Fund	**224 000**	**—**	**—**	**224 000**	**16 690**	**5 670**	**60**	**2 460**	**3 380**	**36 180**	**31 160**	**128 400**
—	17	**Distribution of costs**	**—**	**(30 852)**	**(577 776)**	**608 628**	**59 098**	**17 685**	**264**	**9 846**	**8 485**	**101 917**	**76 271**	**335 062**
—		Corporate burden	**—**	**(30 852)**	**19 574**	**11 278**	**1 458**	**802**	**27**	**301**	**308**	**1 594**	**1 709**	**5 079**
—		Interconnectors	**—**	**—**	**2 297**	**(2 297)**	**—**	**60**	**—**	**—**	**(896)**	**—**	**(181)**	**(1 280)**
—		Use of circuits	**—**	**—**	**—**	**—**	**—**	**330**	**16**	**151**	**(167)**	**—**	**(2)**	**(328)**
—		Transmission costs	**—**	**—**	**(15 197)**	**15 197**	**9 141**	**943**	**32**	**1 109**	**1 215**	**2 013**	**—**	**744**
—		Electricity supplied	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**—**	**1 360**	**(1 360)**
—		Excess local generating costs	**—**	**—**	**(7 158)**	**7 158**	**2 504**	**—**	**—**	**1 048**	**—**	**3 606**	**—**	**—**
—		Pooled generation	**—**	**—**	**(577 292)**	**577 292**	**45 995**	**15 550**	**189**	**7 237**	**8 025**	**94 704**	**73 385**	**332 207**

R000

1976 Corporate Services	Central Generating	Distribution Undertakings Total	Cape Western	Cape Northern	Cape Eastern	Border	Orange River	Natal	Eastern Transvaal	Rand and O.F.S.
		656 381	73 195	21 756	624	14 035	9 749	121 499	78 337	337 186
		212 253	25 307	2 333	363	1 382	868	37 763	46 036	98 201
		211 595	29 033	4 528	62	11 527	8 832	62 027	8 486	87 100
		163 580	—	10 013	—	—	—	3 092	18 224	132 251
		46 089	7 926	4 245	—	—	—	14 840	4 913	14 165
		22 864	10 929	637	199	1 126	49	3 777	678	5 469
14 100	311 594	60 045	11 285	3 528	296	2 656	1 504	11 220	7 269	22 287
232	237 147	1 415	148	111	5	176	162	168	138	507
8	33 406	18 297	3 880	658	76	602	71	2 508	3 250	7 252
—	2 251	148	—	—	107	—	41	—	—	—
13 860	38 790	40 185	7 257	2 759	108	1 878	1 230	8 544	3 881	14 528
387	141 815	73 097	8 699	4 511	179	2 008	2 655	11 879	10 662	32 504
390	108 744	64 698	7 702	4 056	160	1 831	2 349	10 340	9 485	28 775
(3)	11 921	8 249	997	455	19	177	306	1 389	1 177	3 729
—	21 150	150	—	—	—	—	—	150	—	—
—	35 372	19 912	2 178	1 053	35	617	755	3 480	2 937	8 857
—	514	1 186	32	19	1	206	208	544	46	130
—	34 858	18 726	2 146	1 034	34	411	547	2 936	2 891	8 727
(14 487)	(488 781)	503 268	50 941	13 425	122	9 327	7 328	86 730	56 566	278 829
(14 487)	9 190	5 297	698	289	10	126	151	814	741	2 468
—	2 135	(2 135)	—	53	—	—	(732)	—	(181)	(1 275)
—	—	—	—	345	8	122	(130)	—	(4)	(341)
—	(10 175)	10 175	5 861	453	15	624	998	1 915	—	309
—	—	—	—	—	—	—	—	—	896	(896)
—	(17 104)	17 104	6 221	—	—	2 600	—	8 283	—	—
—	(472 827)	472 827	38 161	12 285	89	5 855	7 041	75 718	55 114	278 564

Loans outstanding

at 31 December 1977

Schedule 1

R000

Loan	R000	Per cent		Out-standing	1976
Internal registered stock					
33	16 000	4,625	1975/80	**16 000**	16 000
34	16 000	4,875	1975/80	**16 000**	16 000
35	16 500	5,125	1976/81	**16 500**	16 500
36	20 000	5,125	1977/82	**20 000**	20 000
37	22 000	5,125	1976/82	**22 000**	22 000
38	24 000	5,125	1977/83	**24 000**	24 000
39	24 000	5,375	1978/83	**24 000**	24 000
40	22 000	5,625	1979/84	**22 000**	22 000
42	20 000	5,375	1979/84	**20 000**	20 000
43	16 000	5,375	1979/85	**16 000**	16 000
44	16 000	5,375	1980/85	**16 000**	16 000
45	17 000	5,5	1980/86	**17 000**	17 000
46	16 000	5,875	1981/86	**16 000**	16 000
47	18 000	6,25	1981/86	**18 000**	18 000
49	18 000	6,125	1982/87	**18 000**	18 000
50	22 000	5,25	1982/87	**22 000**	22 000
51	29 000	5	1983/88	**29 000**	29 000
52	40 000	5	1980/83	**40 000**	40 000
53	20 000	5	1982/84	**20 000**	20 000
54	20 000	5,5	1982/84	**20 000**	20 000
55	32 000	5,875	1983/85	**32 000**	32 000
56	38 000	6,5	1983/85	**38 000**	38 000
58	30 000	6,5	1989/91	**30 000**	30 000
60	35 000	6,75	1991	**35 000**	35 000
61	35 000	6,875	1992	**35 000**	35 000
64	12 000	6,5	1992	**12 000**	12 000
65	37 000	6,875	1992	**37 000**	37 000
70	10 000	6,5	1993	**10 000**	10 000
71	70 000	6,875	1993	**70 000**	70 000
75	22 000	6,5	1993	**22 000**	22 000
76	48 000	6,875	1993	**48 000**	48 000
78	20 000	6,5	1994	**20 000**	20 000
79	30 000	6,875	1994	**30 000**	30 000
81	10 000	6,5	1994	**10 000**	10 000
82	25 000	6,875	1994	**25 000**	25 000
83	18 000	7,5	1995	**18 000**	18 000
84	3 000	7	1995	**3 000**	3 000
85	35 000	8,75	1995	**35 000**	35 000
86	10 000	8,5	1995	**10 000**	10 000
87	45 000	9,25	1996	**45 000**	45 000
88	10 000	8,75	1996	**10 000**	10 000
89	20 000	9,25	1996	**20 000**	20 000
90	30 000	9,25	1996	**30 000**	30 000
91	10 000	8,75	1996	**10 000**	10 000
Carried forward				**1 047 500**	1 047 500

R000

Loan	R000	Per cent		Out-standing	1976
Brought forward				**1 047 500**	1 047 500
92	20 000	9,25	1997	**20 000**	20 000
93	22 000	9,125	1997	**22 000**	22 000
94	5 000	8,75	1997	**5 000**	5 000
95	25 000	8,5	1997	**25 000**	25 000
96	28 000	8,25	1997	**28 000**	28 000
97	7 000	8	1997	**7 000**	7 000
98	45 000	8,25	1997	**45 000**	45 000
99	30 000	8,25	1998	**30 000**	30 000
100	20 000	8,375	1998	**20 000**	20 000
101	5 000	8	1998	**5 000**	5 000
103	24 000	8	1998	**24 000**	24 000
104	6 000	7,625	1998	**6 000**	6 000
105	30 000	7,25	1979	**30 000**	30 000
106	45 000	8	1998	**45 000**	45 000
107	27 000	9	1999	**27 000**	27 000
108	3 000	8,5	1999	**3 000**	3 000
110	30 000	9,5	1999	**30 000**	30 000
111	11 000	10,75	2000	**11 000**	11 000
112	29 000	10,75	2000	**29 000**	29 000
113	40 000	10,75	2000	**40 000**	40 000
114	25 000	10,75	2000	**25 000**	25 000
115	5 000	10,25	2000	**5 000**	5 000
116	30 000	10,75	2000	**30 000**	30 000
117	5 000	10,875	1985	**5 000**	5 000
118	55 000	11	2000	**55 000**	55 000
119	10 000	10,75	1980/95	**10 000**	10 000
120	4 000	11	1986	**4 000**	4 000
121	40 000	11,4	2001	**40 000**	40 000
122	6 000	11,1	1981/96	**6 000**	6 000
123	40 000	12,75	1996	**40 000**	(a) 40 000
124	10 000	12,65	1986	**10 000**	(b) 10 000
125	20 000	12,45	1981	**20 000**	(c) 20 000
126	40 000	12,5	2001	**40 000**	40 000
127	150 000	12,6	1999	**150 000**	—
128	20 000	12,45	1987	**20 000**	—
129	80 000	12,15	1982	**80 000**	—
130	50 000	11,5	1989	**(a) 50 000**	—
131	250 000	11,15	2002	**(b) 250 000**	—
132	250 000	11,75	2002	**(c) 250 000**	—
				2 589 500	1 789 500
Less payable by stockholders				**9 283**	1 838
123 Not Later than 31 January 1977 . .					(a) 548
124 Not later than 31 January 1977 . .					(b) 523
125 Not later than 31 January 1977 . .					(c) 767
130 Not later than 14 February 1978 . .				**(a) 1 003**	
131 Not later than 14 February 1978 . .				**(b) 2 692**	
132 Not later than 14 February 1978 . .				**(c) 5 588**	
Carried forward				**2 580 217**	1 787 662

R000

Loan	Foreign currency		R000	Per cent		Out-standing	1976
Brough forward						**2 580 217**	1 787 662
Foreign bond issues							
001	DM	50 000 000	(8 921)	6,5	1965/80	**2 676**	3 569
002	US$	15 000 000	(10 776)	7	1967/77	**—**	1 078
003	UA	15 000 000	(10 906)	7	1968/78	**3 522**	5 820
004	DM	100 000 000	(18 034)	6,5	1968/83	**11 064**	12 820
005	DM	100 000 000	(19 583)	8,5	1970/85	**15 666**	17 625
006	UA	12 000 000	(8 263)	9,25	1970/80	**6 339**	6 984
007	DM	100 000 000	(19 556)	8	1971/86	**17 600**	19 556
009	UA	20 000 000	(14 210)	8,25	1971/86	**21 165**	19 424
013	US$	20 000 000	(14 304)	8,5	1971/86	**10 013**	11 085
017	DM	100 000 000	(25 132)	6,25	1972/87	**25 132**	25 132
020	SF	50 000 000	(8 293)	6,5	1973/88	**8 293**	8 293
023	DM	100 000 000	(24 975)	7	1973/88	**24 975**	24 975
027	US$	15 000 000	(10 080)	9,25	1974/89	**9 072**	9 408
Direct placings							
008	DM	10 000 000	(2 054)	8	1971/86	**1 849**	2 054
010	DM	20 000 000	(3 644)	8,5	1971/86	**3 279**	3 644
011	DM	20 000 000	(4 016)	8,5	1971/86	**3 615**	4 016
012	DM	40 000 000	(9 437)	8,5	1971/86	**7 078**	8 257
033	US$	40 000 000	(27 244)	9,375	1975/90	**27 244**	27 244
						2 778 799	1 998 646

Short-term loans and advances

at 31 December 1977 — Schedule 2

R000

Loan	Foreign currency		R000	Per cent		Outstanding	1976
Foreign bond issues							
034	US$	25 000 000	(17 028)	10	1975/80	**17 028**	17 028
035	DM	100 000 000	(27 851)	9,25	1975/80	**27 851**	27 851
037	US$	30 000 000	(26 119)	10,25	1975/83	**26 119**	26 119
Direct placings							
014	SF	9 000 000	(1 585)	6,5	1972/77	—	1 585
015	D.FL	50 000 000	(11 740)	6,5	1972/79	**5 870**	8 805
021	SF	50 000 000	(8 324)	6,75	1973/80	**8 324**	8 324
022	SF	35 000 000	(7 647)	6,75	1973/78	**7 647**	7 647
024	SF	75 000 000	(16 304)	6,5	1973/80	**16 304**	16 304
026	SF	50 000 000	(10 850)	7,25	1973/80	**10 850**	10 850
028	SF	20 000 000	(4 318)	8,5	1974/79	**4 318**	4 318
029	US$	35 000 000	(23 839)	9,125	1974/82	**20 263**	21 455
031	DM	70 000 000	(20 138)	10,5	1975/79	**20 138**	20 138
032	SF	30 000 000	(8 003)	9	1975/82	**8 003**	8 003
036	SF	50 000 000	(13 298)	9	1975/80	**13 298**	13 298
038	SF	50 000 000	(16 226)	8,5	1975/78	**16 226**	16 226
040	Mf	5 000 000	(10 743)	8,5	1976/81	**11 111**	10 048
041A	US$	15 000 000	(13 066)	6,3125	1976/77	—	13 066
042	SF	50 000 000	(17 185)	7,75	1976/80	**17 185**	17 185
043	DM	75 000 000	(25 351)	9,75	1976/80	**25 351**	25 351
044	US$	20 000 000	(17 384)	9,5625	1976/79	**12 189**	17 384
045	US$	10 000 000	(8 706)	8,5	1976/78	**1 350**	8 390
046	US$	10 000 000	(8 706)	8,5	1976/77	—	8 706
049	US$	5 000 000	(4 353)	7,1875	1976/78	**4 353**	4 353
050	DM	13 000 000	(4 476)	7	1976/77	—	4 476
051	DM	10 290 875	(3 553)	7	1976/78	**937**	3 108
052	DM	4 111 852	(1 423)	7	1976/77	—	1 418
053	SF	20 000 000	(7 088)	6,25	1976/78	**7 088**	7 088
054	US$	10 000 000	(8 718)	8,5	1976/81	**8 718**	8 718
055	US$	10 000 000	(8 706)	6,625	1976/79	**7 836**	8 706
056	DM	10 000 000	(3 619)	7,375	1976/77	—	3 619
058	SF	9 500 000	(3 273)	6,75	1977/78	**3 273**	—
059	SF	9 500 000	(3 273)	6,75	1977/78	**3 273**	—
062	SF	20 000 000	(7 181)	6,5	1977/78	**7 181**	—
063	SF	20 000 000	(7 246)	5,25	1977/78	**7 246**	—
064	SF	5 000 000	(1 824)	6,75	1977/78	**1 824**	—
065	US$	15 000 000	(13 059)	7,75	1977/78	**13 059**	—
066	US$	10 000 000	(8 706)	8,1875	1977/78	**8 706**	—
067	DM	30 000 000	(11 758)	8,25	1977/80	**11 758**	—
068	DM	25 000 000	(9 376)	7,5	1977/79	**9 376**	—
070	DM	20 000 000	(7 773)	8	1977/80	**7 773**	—
071	SF	20 000 000	(8 132)	5	1977/78	**8 132**	—
072	DM	10 000 000	(3 937)	6,625	1977/78	**3 937**	—
074A	DM	19 000 000	(7 814)	6	1977/78	**7 814**	—
074B	DM	21 500 000	(8 745)	5,75	1977/78	**8 745**	—
Total short-term loans						**400 454**	349 567
Foreign revolving credits						**319 842**	376 729
Local short-term advances						**218 500**	165 200
						938 796	891 496

Investments of the Capital Development Fund

at 31 December 1977

Schedule 3

R000

Description			Loan	Nominal value	Book value
Escom internal registered stock					
8,5	per cent	1997	95	7 000	6 755
8,25	per cent	1997	98	7 400	7 317
8,375	per cent	1998	100	2 000	1 991
8	per cent	1998	103	75	75
8	per cent	1998	106	13 000	13 000
9,5	per cent	1999	110	2 565	2 546
10,75	per cent	2000	112	2 424	2 375
10,75	per cent	2000	113	19 489	19 088
10,75	per cent	2000	114	191	190
10,75	per cent	2000	116	10 000	9 941
11	per cent	2000	118	9 283	9 169
11,4	per cent	2001	121	259	259
12,75	per cent	1996	123	634	634
12,6	per cent	1999	127	41 190	41 190
11,15	per cent	2002	131	150 000	142 790
11,75	per cent	2002	132	169 000	169 000
Total (Note 8)				434 510	426 320
Interest accrued					9 416
					435 736
Market value			431 318		

Investments of the Reserve Fund

at 31 December 1977 — Schedule 4

R000

Description		Loan	Nominal value	Book value
Escom internal registered stock				
4,625	per cent	1975/80	33	684	608
4,875	per cent	1975/80	34	907	793
5,125	per cent	1976/81	35	118	102
5,125	per cent	1977/82	36	1 317	1 077
5,125	per cent	1976/82	37	1 966	1 555
5,125	per cent	1977/83	38	1 543	1 228
5,375	per cent	1978/83	39	220	172
5,625	per cent	1979/84	40	1 931	1 644
5,375	per cent	1979/84	42	2 012	1 744
5,375	per cent	1979/85	43	682	550
5,375	per cent	1980/85	44	1 395	1 184
5,5	per cent	1980/86	45	2 453	2 098
5,875	per cent	1981/86	46	2 738	2 519
6,25	per cent	1981/86	47	3 877	3 439
6,125	per cent	1982/87	49	2 279	2 098
5,25	per cent	1982/87	50	35	22
5	per cent	1983/88	51	12	7
5	per cent	1980/83	52	3 804	2 998
5	per cent	1982/84	53	2 755	2 420
5,5	per cent	1982/84	54	2 699	2 406
5,875	per cent	1983/85	55	4 434	4 062
6,5	per cent	1983/85	56	4 495	3 977
6,5	per cent	1989/91	58	3 886	3 710
6,75	per cent	1991	60	4 451	4 353
6,875	per cent	1992	61	3 921	3 873
6,875	per cent	1992	65	8 756	8 619
6,875	per cent	1993	71	7 228	6 885
6,5	per cent	1993	75	1 541	1 434
6,875	per cent	1993	76	8 727	8 441
6,5	per cent	1994	78	1 985	1 874
6,875	per cent	1994	79	6 833	6 708
6,5	per cent	1994	81	1 566	1 447
6,875	per cent	1994	82	3 210	3 088
7,5	per cent	1995	83	1 718	1 718
7	per cent	1995	84	1 338	1 270
8,75	per cent	1995	85	7 380	7 380
8,5	per cent	1995	86	815	796
9,25	per cent	1996	87	86	86
8,75	per cent	1996	91	220	219
9,125	per cent	1997	93	11	11
8,75	per cent	1997	94	98	98
8,5	per cent	1997	95	189	182
8,25	per cent	1997	98	4 283	4 235
8,25	per cent	1998	99	1 424	1 382
8,375	per cent	1998	100	2 783	2 771
7,25	per cent	1979	105	602	583
8	per cent	1998	106	199	199
9	per cent	1999	107	18	13
10,75	per cent	2000	111	1	1
10,875	per cent	1985	117	39	38
10,75	per cent	1980/95	119	5 745	5 745
11	per cent	1986	120	4	4
11,1	per cent	1981/96	122	1 047	1 047
12,65	per cent	1986	124	10	10
12,45	per cent	1981	125	3	3
Carried forward				122 473	114 926

R000

Description		Loan	Nominal value	Book value
Brought forward			122 473	114 926
12,45	per cent	1987	128	215	215
12,15	per cent	1982	129	3 872	3 872
11,5	per cent	1989	130	36 409	36 409
11,15	per cent	2002	131	8 453	8 047
11,75	per cent	2002	132	22 438	22 438
Total (Note 8)				193 860	185 907
Republic of South Africa					
5,25	per cent	1979		700	691
Municipal stock					
Bloemfontein					
5,375	per cent	1975/80		100	94
Cape Town					
5,375	per cent	1980/85	203	600	536
5,5	per cent	1981/86	208	850	750
5,5	per cent	1983/88	219	610	526
5,5	per cent	1980	227	100	96
6,5	per cent	1981	240	210	205
Durban					
5,375	per cent	1974/79	68	600	582
5,375	per cent	1976/80	70	800	762
5	per cent	1984	84	500	437
5,5	per cent	1982	87	450	417
6	per cent	1980	88	500	484
6	per cent	1981	91	1 000	957
6,5	per cent	1981	93	1 000	974
Germiston					
5,375	per cent	1985	16	150	131
Johannesburg					
5,375	per cent	1974/79	36	120	116
Pretoria					
5	per cent	1961/81	7	246	230
5,375	per cent	1975/78	44	100	100
5,375	per cent	1975/78	47	100	99
6,25	per cent	1977/82	49	200	191
5,5	per cent	1980/83	56	200	183
6,5	per cent	1981/84	59	200	191
Rand Water Board					
6,5	per cent	1984	33	250	239
7	per cent	1987	35	200	196
External investments (Note 5)				9 786	9 187
				203 646	195 094
Interest accrued					3 328
					198 422
Market value			171 900		

Investments of the Redemption Fund

at 31 Desember 1977

Schedule 5

Description		Loan	Nominal value R000	Book value R000
Escom internal registered stock				
5,375 per cent	1979/84	42	5 490	5 023
5,375 per cent	1979/85	43	6 121	5 558
5,375 per cent	1980/85	44	7 192	6 476
5,5 per cent	1980/86	45	3 236	2 934
5,875 per cent	1981/86	46	7 557	7 008
6,25 per cent	1981/86	47	1 574	1 491
6,125 per cent	1982/87	49	3 702	3 481
5 per cent	1982/84	53	100	89
5,5 per cent	1982/84	54	3 227	2 950
5,875 per cent	1983/85	55	9 897	9 331
6,5 per cent	1989/91	58	9 334	8 806
6,75 per cent	1991	60	4 245	4 051
6,875 per cent	1992	61	6 293	6 073
6,5 per cent	1992	64	2 071	1 960
6,875 per cent	1992	65	4 296	4 027
6,5 per cent	1993	70	2 276	2 100
6,875 per cent	1993	71	5 425	5 066
6,5 per cent	1993	75	1 884	1 631
6,875 per cent	1993	76	2 564	1 661
6,5 per cent	1994	78	4 362	3 862
6,875 per cent	1994	79	11 363	11 006
6,5 per cent	1994	81	2 959	2 719
6,875 per cent	1994	82	9 293	8 911
7,5 per cent	1995	83	655	538
7 per cent	1995	84	143	108
8,75 per cent	1995	85	8 908	8 786
8,5 per cent	1995	86	1 584	1 492
9,25 per cent	1996	87	4 590	4 311
8,75 per cent	1996	88	211	187
9,25 per cent	1996	89	1 243	1 219
9,25 per cent	1996	90	2 727	2 591
8,75 per cent	1966	91	6 834	6 494
9,25 per cent	1997	92	81	81
9,125 per cent	1997	93	454	380
8,75 per cent	1997	94	411	377
8,5 per cent	1997	95	5 733	5 474
8,25 per cent	1997	96	6 132	5 943
8 per cent	1997	97	219	196
8,25 per cent	1997	98	10 732	10 607
8,25 per cent	1998	99	7 500	7 274
8,375 per cent	1998	100	2 789	2 657
8 per cent	1998	101	2 136	2 029
7,625 per cent	1998	104	85	81
8 per cent	1998	106	23 820	23 820
9 per cent	1999	107	234	193
8,5 per cent	1999	108	504	463
Carried forward			202 186	191 515

Description		Loan	Nominal value R000	Book value R000
Brought forward			202 186	191 515
10,75 per cent	2000	111	4	3
10,75 per cent	2000	112	1 416	1 315
10,75 per cent	2000	113	323	291
10,25 per cent	2000	115	171	161
10,75 per cent	2000	116	10 078	9 826
11 per cent	2000	118	820	772
10,75 per cent	1980/95	119	733	733
11,4 per cent	2001	121	1 001	981
12,75 per cent	1996	123	17	17
12,5 per cent	2001	126	4	4
12,6 per cent	1999	127	1 943	1 943
11,15 per cent	2002	131	70 195	66 821
11,75 per cent	2002	132	35 956	35 956
Total (Note 8)			324 847	310 338
Republic of South Africa				
5,25 per cent	1979		300	296
6 per cent	1985		500	489
Municipal stock				
Bloemfontein				
5,375 per cent	1975/80		80	76
Cape Town				
5,375 per cent	1980/85	203	300	268
Durban				
5,375 per cent	1974/79	68	120	117
Germiston				
5,375 per cent	1985	16	20	17
Johannesburg				
5,375 per cent	1974/79	36	194	188
External investments (Note 5)			1 514	1 451
			326 361	311 789
Interest accrued				4 910
				316 699
Market value		269 735		
Funds at call (Note 9)				42 500
				359 199

Investments in Escom foreign loan bonds

at 31 December 1977

Schedule 6

Description		Loan		Foreign currency	Nominal value	Book value
					R000	
German	6,5 per cent 1965/80	FF001	DM	475 000	85	78
Units of Account	7 per cent 1968/78	FF003	UA	115 000	202	166
German	6,5 per cent 1968/83	FF004	DM	3 069 000	553	497
German	8,5 per cent 1970/85	FF005	DM	2 117 000	415	383
Units of Account	9,25 per cent 1970/80	FF006	UA	105 000	185	155
German	8 per cent 1971/86	FF007	DM	4 687 000	917	799
Units of Account	8,25 per cent 1971/86	FF009	UA	543 000	956	757
Euro-dollar	8,5 per cent 1971/86	FF013	$	711 000	509	473
German	6,25 per cent 1972/86	FF017	DM	6 271 000	1 576	1 283
German	7 per cent 1973/88	FF023	DM	4 893 000	1 231	1 015
Euro-dollar	9,25 per cent 1974/89	FF027	$	500 000	336	304
Euro-dollar	Floating 1975/82	FF029	$	1 332 000	907	884
Total (Note 8)					7 872	6 794
Interest accrued						258
						7 052
Market value				11 629		

Capital Development Fund Account

for the year ended 31 December 1977

Schedule 7

	R000		R000	
			1976	
Amounts set aside		**224 000**		53 584
Cape Western Undertaking	**16 690**		2 146	
Cape Northern Undertaking	**5 670**		1 034	
Cape Eastern Undertaking	**60**		34	
Border Undertaking	**2 460**		411	
Orange River Undertaking	**3 380**		547	
Natal Undertaking	**36 180**		2 936	
Eastern Transvaal Undertaking	**31 160**		2 891	
Rand and Orange Free State Undertaking	**128 400**		8 727	
Central Generating Undertaking	**—**		34 858	
Investment income		**33 229**		15 130
Interest earned	**33 169**		15 118	
Adjustments of investment values	**60**		12	
Balance at beginning of year		**181 601**		112 887
Balance at end of year (Note 10)		**438 830**		181 601

Reserve Fund Account

for the year ended 31 December 1977

Schedule 8

	R000		R000	
			1976	
Amounts set aside		**900**		1 700
Cape Western Undertaking	—		32	
Cape Northern Undertaking	—		19	
Cape Eastern Undertaking	—		1	
Border Undertaking	**200**		206	
Orange River Undertaking	**200**		208	
Natal Undertaking	**500**		544	
Eastern Transvaal Undertaking	—		46	
Rand and Orange Free State Undertaking	—		130	
Central Generating Undertaking	—		514	
Investment income		**16 525**		14 670
Interest earned	**15 844**		14 348	
Adjustments of investment values	**681**		322	
		17 425		16 370
Expenditure		**4 212**		4 334
Cape Western Undertaking	**42**		97	
Cape Northern Undertaking	**418**		106	
Cape Eastern Undertaking	**6**		—	
Border Undertaking	**43**		—	
Orange River Undertaking	**2**		12	
Natal Undertaking	**119**		288	
Eastern Transvaal Undertaking	**63**		19	
Rand and Orange Free State Undertaking	**471**		315	
Central Generating Undertaking	**3 048**		3 497	
		13 213		12 036
Balance at beginning of year		**195 861**		183 825
Balance at end of year (Note 10)		**209 074**		195 861

Redemption Fund Account

for the year ended 31 December 1977

Schedule 9

	R000		R000	
				1976
Balance at beginning of year		**325 683**		318 865
Amounts contributed		**24 606**		20 131
Cape Western Undertaking	**1 398**		984	
Cape Northern Undertaking	**703**		455	
Cape Eastern Undertaking	**24**		19	
Border Undertaking	**250**		165	
Orange River Undertaking	**417**		306	
Natal Undertaking	**1 720**		1 389	
Eastern Transvaal Undertaking	**1 702**		1 178	
Rand and Orange Free State Undertaking	**4 854**		3 714	
Central Generating Undertaking	**13 538**		11 921	
Other contributions		**236**		36
Proceeds of sales of fixed property		**954**		1 168
Investment income		**31 087**		27 483
Interest earned	**30 750**		27 830	
Adjustments of investment values	**337**		(347)	
		382 566		367 683
Repayment of internal registered stock		**—**		42 000
6,25 per cent 1976 (Loan 102)			30 000	
8 per cent 1976 (Loan 109)			12 000	
Balance at end of year (Note 10)		**382 566**		325 683

We have examined the accounting records of the Redemption Fund. In our opinion proper records have been kept and the Fund has been maintained in accordance with the requirements of the Electricity Act, 1958.

Alex. Aiken & Carter
Halsey, Button & Perry
Chartered Accountants (S.A.)
Auditors

Johannesburg
23 March 1978

Power stations: principal equipment installed

at 31 December 1977

Statement No. 1

Power station	Station capacity			Boilers		Main turbo-generators		Steam conditions at turbine inlet	
	Boilers kg/s	Generators MW	Assigned sent-out rating MW	No.	Maximum continuous rating each kg/s	No.	Normal rating each MW	Pressure MPa (abs)	Temperature °C
Coal-fired station, Eastern Cape									
West Bank 1	27,6	15,0	14	4	6,9	2	7,5	1,6	371
West Bank 2	85,6	45,0		4	21,4	3	15,0	2,9	427
	53,0	40,0		2	26,5	2	20,0	2,9	427
	138,6	85,0	80	6		5			
Sub-total	166,2	100,0	94	10		7			
Coal-fired stations, Natal									
Colenso	113,5	75,0		5	22,7	3	25,0	2,0	385
	50,4	30,0		2	25,2	1	30,0	2,0	385
	163,9	105,0	91	7		4			
Congella	201,6	70,0		8	25,2	2	35,0	4,3	435
		37,0				1	37,0	4,3	435
	201,6	107,0	97	8		3			
Ingagane	567,0	500,0	465	5	113,4	5	100,0	8,4	510
Umgeni	181,6	120,0		8	22,7	4	30,0	4,2	454
	164,0	120,0		5	32,8	2	60,0	4,2	454
	345,6	240,0	222	13		6			
Sub-total	1 278,1	952,0	875	33		18			
Coal-fired stations, Transvaal and O.F.S.									
Arnot	1 998,6	2 100,0	1 980	6	333,1	6	350,0	15,9	510/510
Camden	1 814,4	1 600,0	1 520	8	226,8	8	200,0	10,3	538
Grootvlei	1 071,0	1 200,0		5	214,2	6	200,0	10,3	538
	230,6			1	230,6			10,3	538
	1 301,6	1 200,0	1 140	6		6			
Hendrina	2 142,0	2 000,0	1 900	10	214,2	10	200,0	10,3	538
Highveld	554,4	480,0	440	8	69,3	8	60,0	6,3	482
Klip	567,5	396,0		25	22,7	12	33,0	2,5	390
		*28,0							
	567,5	424,0	372	25		12			
Komati	567,0	500,0		5	113,4	5	100,0	8,4	510
	566,8	500,0		4	141,7	4	125,0	8,4	510
	1 133,8	1 000,0	925	9		9			
Kriel	880,0	1 000,0	950	2	440,0	2	500,0	16,0	510/510
Taaibos	584,0	480,0	440	8	73,1	8	60,0	4,2	441
Vaal	430,2	297,0		18	23,9	7	33,0	2,5	427
		†21,0							
	430,2	318,0	282	18		9			
Vierfontein	503,5	360,0	336	19	26,5	12	30,0	4,2	441
Wilge	62,8			4	15,7				
	201,6	60,0		4	50,4	2	30,0	4,2	454
	73,1	180,0		1	73,1	3	60,0	4,2	454
	337,5	240,0	221	9		5			
Sub-total	12 247,5	11 202,0	10 506	128		95			

Statement No. 1
(continued)

Power station	Station capacity			Boilers		Main turbo-generators		Steam conditions at turbine inlet	
	Boilers kg/s	Generators MW	Assigned sent-out rating MW	No.	Maximum continuous rating each kg/s	No.	Normal rating each MW	Pressure MPa (abs)	Temperature °C
Coal-fired stations, Western Cape									
Hex River	100,8	60,0		4	25,2	3	20,0	4,2	427
	69,2	60,0		2	34,6	2	30,0	4,2	482
	170,0	120,0	114	6		5			
Salt River 1	75,6	60,0	57	6	12,6	3	20,0	2,9	385
Salt River 2	328,0	120,0		10	32,8	4	30,0	4,2	482
		120,0				2	60,0	4,2	482
	328,0	240,0	228	10		6			
Sub-total	573,6	420,0	399	22		14			
Total, coal-fired stations	14 265,4	12 674,0	11 874	193		134			
Gas turbine stations									
Acacia (Western Cape)		171,0	171			3	57,0		
Port Rex (Eastern Cape)		171,0	171			3	57,0		
Total, gas turbine stations		342,0	342			6			
Hydro-electric stations, conventional storage									
Hendrik Verwoerd		320,0	320			4	80,0		
Vanderkloof		220,0	220			2	110,0		
Total, hydro stations		540,0	540			6			
Total, all Escom	14 265,4	13 556,0	12 756	193		146			

Other Power Sources

	Firm capacity available to Escom MW
Cabora Bassa	700

*Four 7 MW house sets installed at Klip.
†Three 7 MW house sets installed at Vaal.

Transmission lines and cables:

Circuit kilometres (excluding service connections on reticulation systems)

at 31 December 1977

Statement No. 1
(continued)

(a) Transmission lines

Undertaking	533 kV D.C. (Monopolar)	400 kV	275 kV	220 kV	165 kV	132 kV	88 kV	66 kV	42 kV	33 kV	22 kV 21 kV	11 kV	6,6 kV	3,3 kV	2,0 kV 2,1 kV 2,2 kV	380 V 220 V	Total
Border				159,85		9,55		717,93		57,48	592,72	1 728,36		5,78		187,95	3 459,62
Cape Eastern											285,79	226,56				17,59	529,94
Cape Northern			580,02		221,60	2 215,57		608,50			1 744,22	1 871,99				137,57	7 379,47
Cape Western						1 210,40		1 877,89	27,80	163,66	1 165,92	6 007,63	556,06			2 289,73	13 299,09
Eastern Transvaal			1 024,62			2 079,20	1 177,83	291,38		10,20	4 971,20	4 817,35	128,13	13,52	79,96	345,52	14 938,91
Natal			1 268,60			1 308,90	2 385,86			902,70	990,84	8 560,13	8,30		1,53	812,58	16 239,44
Orange River				494,97		152,77		819,07			1 218,95	130,47				3,33	2 819,56
Rand and O.F.S.		430,49	2 772,41			4 087,09	6 660,32	126,57	2 531,37	14,80	2 212,93	13 464,69	554,39		1,62	1 335,56	34 192,24
Central Generating	1 029,70	5 800,73		388,10		16,00											7 234,53
							10 224,01	4 441,34	2 559,17	1 148,84	13 182,57	36 807,18	1 246,88	19,30	83,11	5 129,83	
Totals "A"	1 029,70	6 231,22	5 645,65	1 042,92	11 301,08		18 373,36				56 468,87						100 092,80

(b) Underground cables

Border											0,02	42,92		3,15		52,77	98,86
Cape Eastern																2,79	2,79
Cape Northern								0,32			1,87	2,00				34,12	38,31
Cape Western						20,10		47,30		63,73	5,77	1 350,33	15,46	0,71		1 878,50	3 381,90
Eastern Transvaal											40,77	71,14	3,15	1,67	4,78	149,29	270,80
Natal							1,89			4,50	7,57	425,05	6,52	0,47	0,02	270,57	716,59
Orange River																1,07	1,07
Rand and O.F.S.							54,65		168,58	0,33	190,92	501,77	694,88	0,21	0,95	524,54	2 136,83
							56,54	47,62	168,58	68,56	246,92	2 393,21	720,01	6,21	5,75	2 913,65	
Totals "B"					20,10		341,30				6 285,75						6 647,15

(c) Total lines and cables

A + B = C 1977	1 029,70	6 231,22	6 688,57	11 321,18			10 280,55	4 488,96	2 727,75	1 217,40	13 429,49	39 200,39	1 966,89	25,51	88,86	8 043,48	
							18 714,66				62 754,62						106 739,95
D 1976	1 029,70	*5 745,00	*5 660,30	10 855,01			17 847,71				59 304,46						100 442,18
Additions: C – D = E	—	486,22	1 028,27	466,17			866,95				3 450,16						6 297,77

*Amended figures.

Capacity of transformers in service

at 31 December 1977

Statement No. 1
(continued)

Undertaking	Number		Capacity MVA	
	1976	1977	1976	1977
Border	1 306	1 403	685,724	706,385
Cape Eastern	636	646	18.079	43.089
Cape Northern	3 190	3 320	1 617,768	2 599,838
Cape Western	11 191	11 626	4 579,222	5 182,575
Eastern Transvaal	6 635	7 140	7 820,685	9 205,996
Natal	9 189	9 858	9 212,736	9 802,196
Orange River	301	332	3 755,262	3 767,129
Rand and O.F.S.	19 144	21 186	33 890,414	39 580,785
Central Generating	*1 238	1 281	*30 032,884	32 957,697
Totals	*52 830	56 792	*91 612,774	103 845,690

*Amended figures.

Power purchased from outside sources

Statement No. 2

Purchased from	kWh					
	1972	1973	1974	1975	1976	**1977**
Department of Water Affairs*	2 986 020	3 506 570	4 518 726	4 518 726	9 877 852	**7 971 201**
Port Elizabeth Municipality (Aloes)	5 706 956	6 426 031	1 375 020	—	—	—
Port Elizabeth Municipality (Summit)	958 440	1 337 160	1 977 465	1 264 860	1 283 933	**1 140 720**
Cabora Bassa	—	—	—	25 152 400	1 214 338 300	**4 231 949 300**
Pretoria Municipality	2 160	—	—	—	—	—
Total kWh purchased	9 653 576	11 269 761	7 871 211	34 868 460	1 225 500 085	**4 241 061 221**
Total kWh sold	41 648 918 788	46 578 458 899	52 585 098 245	57 869 160 163	63 355 717 041	**67 125 397 300**
Purchased as percentage of sales	0,023%	0,024%	0,015%	0,060%	1,934%	**6,318%**

*Plant owned by Department of Water Affairs, but run by Central Generating Undertaking since 1 July 1977.

kWh sold and number of consumers, 1977

Statement No. 3

In licensed areas of Undertakings

	Bulk			Domestic and street lighting			Industrial			Mining				Traction			Total		
	kWh	Per cent	Number of consumers	kWh	Per cent	Number of consumers	kWh	Per cent	Number of consumers	kWh	Per cent	Number of consumers		kWh	Per cent	Number of consumers	kWh	Per cent	Number of consumers
Border	644 342 182	3,09	19	29 937 326	2,88	3 898	53 046 206	0,25	976	—	—	—		—	—	—	727 325 714	1,08	4 893
Cape Eastern	8 448 680	0,04	2	4 045 637	0,39	638	9 738 012	0,04	293	—	—	—		—	—	—	22 232 329	0,03	933
Cape Northern	364 616 201	1,75	30	28 735 285	2,76	3 243	120 483 832	0,56	981	882 659 765	4,38	77		271 504 656	7,74	3	1 667 999 739	2,49	4 334
Cape Western	2 657 539 507	12,74	57	415 144 757	39,94	59 990	1 493 572 014	6,92	16 151	—	—	—		461 946 636	13,17	6	5 028 202 914	7,49	76 204
Eastern Transvaal	904 874 826	4,34	29	29 089 420	2,80	2 402	5 579 472 269	25,86	7 297	2 125 672 143	10,56	127		423 116 496	12,06	12	9 062 225 154	13,50	9 867
Natal	5 771 157 852	27,66	35	123 057 191	11,84	17 131	3 510 282 293	16,27	12 403	245 561 785	1,22	34		1 096 441 367	31,26	15	10 746 500 488	16,01	29 618
Orange River	1 010 730 688	4,84	39	1 015 659	0,10	113	25 735 728	0,12	166	—	—	—		—	—	—	1 037 482 075	1,55	318
Rand and O.F.S.	9 500 614 134	45,54	157	408 466 969	39,29	19 328	10 784 810 476	49,98	24 240	16 884 793 243	83,84	102		1 254 744 065	35,77	2	38 833 428 887	57,85	43 829
Total electricity	20 862 324 070	100,00	368	1 039 492 244	100,00	106 743	21 577 140 830	100,00	62 507	20 138 686 936	100,00	340		3 507 753 220	100,00	38	67 125 397 300	100,00	169 996
Per cent of total		31,08			1,55			32,14			30,00				5,23			100,00	

In provinces of South Africa and neighbouring territories

Cape	4 665 284 656	22,36	130	475 147 651	45,71	67 430	1 697 296 860	7,87	18 464	836 562 175	4,16	64		683 451 292	19,48	8	8 357 742 634	12,45	86 096
Natal	5 602 342 178	26,85	23	113 531 989	10,92	15 250	3 429 717 138	15,89	10 642	245 561 785	1,22	34		932 163 417	26,58	13	10 323 316 507	15,38	25 962
O.F.S.	1 110 282 216	5,32	71	9 587 866	0,92	1 542	1 115 540 398	5,17	1 216	4 295 965 600	21,33	24		344 180 898	9,81	2	6 875 556 978	10,24	2 855
Transvaal	9 080 129 193	43,53	130	440 933 150	42,42	22 470	15 330 526 094	71,05	32 137	14 760 093 536	73,29	214		1 547 957 613	44,13	15	41 159 639 586	61,32	54 966
Bophuthatswana	659 820	0,01	4	2 822	0,00	4	22 567	0,00	5	503 840	0,00	4		—	—	—	1 189 049	0,00	17
Lesotho	61 324 041	0,29	3	—	—	—	—	—	—	—	—	—		—	—	—	61 324 041	0,09	3
Mozambique	168 235 000	0,81	2	—	—	—	—	—	—	—	—	—		—	—	—	168 235 000	0,25	2
Rhodesia	9 443 316	0,05	1	—	—	—	—	—	—	—	—	—		—	—	—	9 443 316	0,02	1
Swaziland	101 142 970	0,48	1	—	—	—	—	—	—	—	—	—		—	—	—	101 142 970	0,15	1
Transkei	63 480 680	0,30	3	288 766	0,03	47	4 037 773	0,02	43	—	—	—		—	—	—	67 807 219	0,10	93
Total electricity	20 862 324 070	100,00	368	1 039 492 244	100,00	106 743	21 577 140 830	100,00	62 507	20 138 686 936	100,00	340		3 507 753 220	100,00	38	67 125 397 300	100,00	169 996

Power station operating statistics, 1977

Statement No. 4

Power station	Energy generated GWh	Energy sent out GWh	Maximum demands 1 hour sent out MW	Station load factors per cent		Overall thermal efficiency per cent		†Availability per cent	Water used litre/kWh s.o. (excludes colliery and construction)	Coal burnt tons	kg of coal per kWh sent out	Heat content of coal as received (weighted average) MJ/kg	Station heat rate MJ per kWh sent out
				*A	**B	Generated	Sent out						
Coal-fired station, Eastern Cape:													
West Bank 1 and 2	249,0	233,0	94	28,3	28,3	21,6	20,2	86,6	0,63	171 272	0,735	24,25	17,83
Coal-fired stations, Natal:													
Colenso	263,8	244,0	95	30,6	29,3	20,3	18,8	78,3	5,73	184 302	0,755	25,37	19,16
Congella	386,4	350,9	102	41,3	39,3	21,6	19,6	92,6	0,91	266 786	0,760	24,18	18,38
Ingagane	3 252,1	3 050,0	470	74,9	74,1	30,4	28,5	81,3	3,34	1 626 005	0,533	23,71	12,64
Umgeni	824,7	768,5	217	39,5	40,4	23,6	22,0	85,2	3,72	506 063	0,659	24,85	16,36
Sub-total	4 727,0	4 413,4	—	57,6	—	27,3	25,5	83,2	3,35	2 583 156	0,585	24,10	14,11
Coal-fired stations, Transvaal and O.F.S.													
Arnot	11 433,0	10 888,3	1 795	62,8	69,2	34,6	33,0	66,9	2,48	5 260 801	0,483	22,61	10,92
Camden	10 070,0	9 580,9	1 540	72,0	71,0	32,3	30,8	76,3	2,50	4 973 875	0,519	22,55	11,71
Grootvlei	6 237,5	5 935,5	976	70,1	69,4	32,9	31,3	77,2	2,44	3 205 283	0,540	21,28	11,49
Hendrina	12 686,3	12 136,5	1 807	72,9	76,7	32,3	30,9	78,4	2,63	6 057 396	0,499	23,32	11,64
Highveld	2 237,2	2 067,7	430	53,6	54,9	28,5	26,4	86,4	3,83	1 696 829	0,821	16,63	13,65
Klip	1 584,1	1 446,9	378	44,4	43,7	19,9	18,2	91,4	5,61	1 380 840	0,954	20,74	19,79
Komati	6 129,5	5 699,8	906	70,3	71,8	29,0	26,9	75,8	3,26	3 378 765	0,593	22,55	13,37
Kriel (under construction)	5 060,1	4 732,9	1 254	71,7	—	36,7	34,3	70,6	2,95	2 315 802	0,489	21,45	10,50
Taaibos	2 292,0	2 098,8	469	54,5	51,1	27,3	25,0	86,1	4,09	1 709 776	0,815	17,69	14,41
Vaal	1 750,4	1 615,3	275	65,4	67,1	20,7	19,1	85,6	5,44	1 649 212	1,021	18,43	18,82
Vierfontein	1 753,4	1 616,5	334	54,9	55,2	23,2	21,4	85,4	5,02	1 381 017	0,854	19,66	16,80
Wilge	1 562,7	1 448,8	223	74,8	74,2	26,0	24,1	80,5	4,93	1 012 541	0,699	21,41	14,96
Sub-total	62 796,3	59 267,9	—	66,8	—	30,8	29,1	76,5	3,01	34 022 137	0,574	21,54	12,36
Coal-fired stations, Western Cape													
Hex River	277,5	260,7	117	26,1	25,4	23,2	21,8	95,7	3,72	178 465	0,684	24,13	16,52
Salt River 1 and 2	989,9	938,8	261	37,6	41,1	27,0	25,6	85,6	0,34	550 614	0,587	23,96	14,05
Sub-total	1 267,4	1 199,5	—	34,3	—	26,1	24,7	88,5	1,08	729 079	0,608	24,00	14,59
Total for all coal-fired stations	69 039,7	65 113,8	—	64,6	—	30,4	28,7	77,5	2,99	37 505 644	0,576	21,78	12,55
Gas turbine stations:													
Acacia (Western Cape)	8,3	6,3	174	0,4	0,4			91,3					
Port Rex (Eastern Cape)	6,1	5,8	171	0,4	0,4			84,6					
Total for gas turbine stations	14,4	12,1	—	0,4	—			88,0					
Hydro-electric stations:													
Hendrik Verwoerd	897,1	894,1	388	31,9	26,3			94,2					
Vanderkloof	1 034,8	1 030,5	285	58,2	41,3			94,0					
Total for hydro stations	1 931,9	1 924,6	—	42,1	—			94,1					
Total/weighted average	70 986,0	67 050,5	—	61,9	—			78,5					

*Station load factors A = $\frac{\text{kWh s.o.} \times 100}{\text{(assigned s.o. rating)} \times \text{hours in year}}$

**Station load factors B = $\frac{\text{kWh s.o.} \times 100}{\text{(station M.D. s.o.)} \times \text{hours in year}}$

†Availability = $\frac{\text{Capacity hours available} \times 100}{\text{Total capacity hours in year}}$

Statements showing the price or rent of land or rights or interests in or over land or any other property acquired or hired by the Commission during the year ending 31 December 1977

Statement No. 5

Central Generating Undertaking	
Immovable property acquired for considerations amounting to	R3 044 931
Servitudes and other interest in or over land or other property acquired or hired	R763 882
Cape Western Undertaking	
Immovable property acquired for considerations amounting to	R344 022
Servitudes and other interest in or over land or other property acquired or hired	R342 066
Cape Northern Undertaking	
Immovable property acquired for considerations amounting to	R60 484
Servitudes and other interest in or over land or other property acquired or hired	R121 369
Orange River Undertaking	
Immovable property acquired for considerations amounting to	R42 970
Servitudes and other interest in or over land or other property acquired or hired	R33 630
Border Undertaking	
Immovable property acquired for considerations amounting to	R45 910
Servitudes and other interest in or over land or other property acquired or hired	R77 619
Natal Undertaking	
Immovable property acquired for considerations amounting to	R99 516
Servitudes and other interest in or over land or other property acquired or hired	R832 974
Eastern Transvaal Undertaking	
Immovable property acquired for considerations amounting to	R52 940
Servitudes and other interest in or over land or other property acquired or hired	R466 498
Rand and O.F.S. Undertaking	
Immovable property acquired for considerations amounting to	R196 200
Servitudes and other interest in or over land or other property acquired or hired	R688 429
Head Office (Education Department)	
Immovable property acquired for considerations amounting to	R91 000
Cape Eastern Undertaking	
Immovable property acquired for considerations amounting to	R39 500
Servitudes and other interest in or over land or other property acquired or hired	R15 108

GWh sold by undertakings to all consumers

Statement No. 6

Year	Border	Cape Eastern	Cape Northern	Cape Western	Eastern Transvaal	Natal	Orange River	Rand and O.F.S.	Total	Per cent growth for the year
1950	79,9	—	53,9	271,9	384,8	968,3	—	5 151,8	6 910,6	
1951	88,1	—	58,5	303,5	392,9	1 050,4	—	5 563,2	7 456,5	7,9
1952	97,7	—	61,3	341,2	431,1	1 109,6	—	6 039,6	8 080,6	8,4
1953	107,8	—	67,1	375,5	416,3	1 205,5	—	6 559,9	8 732,2	8,1
1954	118,2	—	70,7	436,2	276,1	1 310,2	—	7 465,2	9 676,6	10,8
1955	130,8	—	73,2	527,1	400,3	1 417,2	—	8 416,3	10 964,0	13,3
1956	139,1	—	78,7	585,1	511,9	1 553,1	—	9 151,6	12 019,5	9,6
1957	143,1	—	86,1	698,6	542,5	1 640,4	—	9 652,5	12 763,1	6,2
1958	152,9	—	115,2	826,0	587,1	1 720,2	—	10 200,6	13 602,2	6,6
1959	165,0	—	171,4	861,8	633,3	1 858,0	—	11 034,8	14 724,5	8,3
1960	172,3	—	185,2	871,6	762,0	2 058,3	—	12 044,8	16 094,1	9,3
1961	178,8	—	191,3	860,0	901,5	2 181,5	—	12 700,0	17 013,2	5,7
1962	188,6	—	224,9	945,0	1 012,2	2 320,5	—	13 429,8	18 121,0	6,5
1963	204,9	—	264,9	1 051,4	1 212,1	2 543,6	—	14 223,1	19 500,0	7,6
1964	228,8	0,4	311,4	1 163,9	1 553,6	2 922,1	—	15 067,3	21 247,5	9,0
1965	250,5	1,6	393,2	1 267,4	1 936,8	3 182,5	—	16 111,3	23 143,3	8,9
1966	272,4	2,5	442,4	1 367,0	2 408,2	3 498,5	—	16 563,4	24 554,3	6,1
1967	294,2	3,2	519,9	1 533,1	2 829,6	3 720,6	1,1	17 755,4	26 657,1	8,6
1968	310,5	4,1	609,6	1 666,2	3 191,4	4 121,5	2,4	18 979,3	28 885,0	8,4
1969	330,5	5,7	657,9	1 824,3	3 824,4	4 636,7	8,0	20 218,1	31 505,6	9,1
1970	360,4	6,1	714,9	2 101,0	4 294,1	5 073,5	47,3	22 293,4	34 890,6	10,7
1971	399,9	7,1	789,7	2 494,5	4 561,5	6 072,3	95,0	23 620,0	38 040,0	9,0
1972	448,1	8,4	895,8	2 771,3	5 234,6	6 938,0	144,5	25 208,2	41 648,9	9,5
1973	504,6	9,6	1 060,1	3 148,8	6 097,5	7 581,3	238,8	27 937,7	46 578,4	11,8
1974	551,5	11,5	1 210,5	3 851,6	6 527,4	8 499,9	786,2	31 146,5	52 585,1	12,9
1975	**597,7**	**13,5**	**1 340,4**	**4 655,5**	**7 266,8**	**9 165,8**	**915,4**	**33 914,1**	**57 869,2**	**10,0**
1976	**674,8**	**14,1**	**1 506,7**	**4 930,4**	**8 028,3**	**9 931,1**	**1 034,8**	**37 235,4**	**63 355,7**	**9,5**
1977	**727,3**	**22,3**	**1 668,0**	**5 028,2**	**9 062,2**	**10 746,5**	**1 037,5**	**38 833,4**	**67 125,4**	**6,0**

Note:
Sabie Undertaking incorporated in Eastern Transvaal Undertaking since 1 July 1958, in terms of the Amended Licence.
De-commissioned November 1964. GWh sold in Sabie prior to incorporation included in Eastern Transvaal Undertaking.

Total GWh sold

Statement No. 7

Year	GWh sold							Overall average selling price cents/kWh	Escom employees		Capital expenditure at cost		GWh sent out*	Ratio GWh sold / GWh sent out
	Traction	Bulk supplies	Mining	Air and steam	Industrial and commercial	Domestic and street lighting	Total sold		Total number as at 31 December	Number/GWh sold	R000 Total as at 31 December	R000 per GWh sold		
1950	524,0	1 106,5	3 898,6	276,9	990,7	113,9	6 910,6	0,274 1	9 352	1,353	115 129	16,66	7 417,8	0,932
1951	539,4	1 260,7	4 104,6	267,5	1 149,9	134,4	7 456,5	0,292 2	10 336	1,386	137 283	18,41	8 001,3	0,932
1952	554,8	1 459,5	4 332,9	264,7	1 337,7	131,0	8 080,6	0,311 5	10 889	1,348	176 559	21,85	8 651,3	0,934
1953	584,5	1 640,0	4 736,5	234,2	1 402,1	134,9	8 732,2	0,354 2	11 518	1,319	218 739	25,05	9 395,8	0,929
1954	619,2	1 839,0	5 316,8	219,5	1 539,9	142,2	9 676,6	0,380 8	12 317	1,273	270 621	27,97	10 414,7	0,929
1955	689,7	2 047,6	5 977,4	212,2	1 880,5	156,6	10 964,0	0,413 9	12 490	1,139	304 342	26,76	11 764,4	0,932
1956	739,7	2 282,2	6 445,3	191,2	2 187,1	174,0	12 019,5	0,428 5	12 977	1,080	342 068	28,46	12 927,0	0,930
1957	752,7	2 540,1	6 789,7	159,7	2 331,2	189,7	12 763,1	0,447 8	13 421	1,052	377 265	29,56	13 802,9	0,925
1958	789,0	2 837,8	7 136,2	153,6	2 479,8	205,8	13 602,1	0,473 3	14 312	1,052	417 701	30,71	14 679,9	0,927
1959	887,4	3 057,7	7 676,4	138,2	2 736,5	228,3	14 724,5	0,495 1	13 947	0,947	453 130	30,77	15 870,7	0,928
1960	1 045,2	3 242,8	8 258,7	125,6	3 168,7	253,1	16 094,1	0,507 9	14 654	0,911	491 471	30,54	17 322,8	0,929
1961	1 178,3	3 368,2	8 625,9	123,8	3 437,5	279,5	17 013,2	0,515 5	15 441	0,908	529 565	31,13	18 292,4	0,930
1962	1 296,4	3 570,4	9 143,4	115,7	3 691,8	303,3	18 121,0	0,516 4	16 467	0,909	581 579	32,09	19 416,7	0,933
1963	1 389,0	3 997,5	9 416,3	115,1	4 253,0	329,1	19 500,0	0,517 7	16 804	0,862	637 076	32,67	20 812,2	0,937
1964	1 558,6	4 494,0	9 847,2	93,9	4 973,1	380,7	21 247,5	0,510 1	17 172	0,808	679 193	31,97	22 679,6	0,937
1965	1 762,7	4 920,5	10 270,8	87,2	5 663,1	439,0	23 143,3	0,507 6	17 851	0,771	741 109	32,02	24 709,3	0,937
1966	1 835,8	5 343,6	10 775,1	39,5	6 068,6	491,7	24 554,3	0,525 4	18 579	0,757	840 782	32,24	26 134,0	0,940
1967	1 958,0	5 965,7	11 441,5	Terminated	6 729,1	562,8	26 657,1	0,546 7	19 817	0,743	950 863	35,67	28 440,5	0,937
1968	2 180,7	6 628,1	11 995,5	—	7 438,8	641,9	28 885,0	0,555 0	20 893	0,723	1 114 390	38,58	30 851,4	0,936
1969	2 307,0	7 263,5	12 641,9	—	8 573,8	719,4	31 505,6	0,556 5	21 644	0,687	1 271 785	40,37	33 606,2	0,937
1970	2 409,7	8 108,1	13 947,9	—	9 607,7	817,2	34 890,6	0,554 5	22 700	0,651	1 429 862	40,98	37 328,1	0,935
1971	2 616,3	9 264,5	14 227,1	—	11 013,8	918,3	38 040,0	0,577 2	25 050	0,659	1 604 755	42,19	40 747,7	0,934
1972	2 782,2	10 716,1	14 508,6	—	12 641,5	1 000,5	41 648,9	0,610 8	26 937	0,647	1 774 350	42,60	44 484,7	0,936
1973	2 895,5	12 751,7	15 800,0	—	14 026,0	1 105,2	46 578,4	0,648 4	28 559	0,613	1 942 949	41,71	49 770,4	0,936
1974	3 107,9	15 522,0	16 940,5	—	15 936,7	1 078,0	52 585,1	0,682 2	29 891	0,568	2 175 842	41,38	56 259,1	0,935
1975	3 307,2	18 054,9	17 444,3	—	18 049,6	1 013,2	57 869,2	0,795 0	33 999	0,588	2 569 803	44,41	61 533,3	0,940
1976	3 474,7	20 095,7	18 746,2	—	19 907,0	1 132,1	63 355,7	1,036 0	36 915	0,583	3 211 261	50,69	67 413,7	0,940
1977	3 507,8	20 862,3	20 138,7	—	21 575,0	1 041,6	67 125,4	1,535 3	39 112	0,583	4 192 918	62,46	71 291,5	0,942

*Including purchased GWh.

Summary of consolidated revenue and expenditure account

Statement No. 8

Year	Total Escom GWh sold		Total Escom costs: Interest	Redemption and other provision for loan repayment	Reserve Fund	Capital Development Fund	Sub-total capital related costs	Purchase of electricity	Fuel	Other power station operating and maintenance costs	Distribution, operation and maintenance costs	General expenses	Total costs	Total revenue
1967	26 657,1	R(000)	37 312	24 536	9 912	—	71 760	313	42 488	14 618	7 146	10 603	146 928	146 783
		C/kWh sold	0,140 0	0,092 0	0,037 2	—	0,269 2	0,001 2	0,159 4	0,054 8	0,026 8	0,039 8	0,551 2	0,550 6
		% of total cost	25,39	16,70	6,75	—	48,84	0,21	28,92	9,95	4,86	7,22	100,00	99,90
1968	28 885,0	R(000)	43 282	23 884	12 300	—	79 466	121	45 117	17 016	8 097	12 176	161 993	161 475
		C/kWh sold	0,149 8	0,082 7	0,042 6	—	0,275 1	0,000 4	0,156 2	0,058 9	0,028 0	0,042 2	0,560 8	0,559 0
		% of total cost	26,72	14,74	7,59	—	49,06	0,07	27,85	10,50	5,00	7,52	100,00	99,68
1969	31 505,6	R(000)	50 943	20 809	13 605	—	85 357	102	48 035	19 038	9 264	13 578	175 374	176 106
		C/kWh sold	0,161 7	0,066 0	0,043 2	—	0,270 9	0,000 3	0,152 5	0,060 4	0,029 4	0,043 1	0,556 6	0,559 0
		% of total cost	29,05	11,87	7,76	—	48,67	0,06	27,39	10,86	5,28	7,74	100,00	100,42
1970	34 890,6	R(000)	59 484	23 654	15 202	—	98 340	89	49 440	21 955	10 594	15 448	195 866	193 475
		C/kWh sold	0,170 5	0,067 8	0,043 6	—	0,281 9	0,000 3	0,141 7	0,062 9	0,030 4	0,044 3	0,561 4	0,554 5
		% of total cost	30,37	12,08	7,76	—	50,21	0,05	25,24	11,21	5,41	7,89	100,00	98,78
1971	38 040,0	R(000)	70 266	30 928	8 568	—	109 762	82	53 587	26 276	11 492	18 440	219 639	219 584
		C/kWh sold	0,184 7	0,081 3	0,022 5	—	0,288 5	0,000 2	0,140 9	0,069 1	0,030 2	0,048 5	0,577 4	0,577 2
		% of total cost	31,99	14,08	3,90	—	49,97	0,04	24,40	11,96	5,23	8,40	100,00	99,97
1972	41 648,9	R(000)	86 631	30 575	3 056	13 596	133 858	95	57 259	31 586	13 486	21 737	258 021	254 394
		C/kWh sold	0,208 0	0,073 4	0,007 3	0,032 6	0,321 4	0,000 2	0,137 5	0,075 8	0,032 4	0,052 2	0,619 5	0,610 8
		% of total cost	33,58	11,85	1,18	5,27	51,88	0,04	22,19	12,24	5,23	8,42	100,00	98,59
1973	46 578,4	R(000)	101 858	34 200	3 760	15 366	155 184	117	68 634	38 685	17 082	26 460	306 162	302 034
		C/kWh sold	0,218 7	0,073 4	0,008 1	0,033 0	0,333 2	0,000 3	0,147 4	0,083 1	0,036 7	0,056 8	0,657 3	0,648 4
		% of total cost	33,27	11,17	1,23	5,02	50,69	0,04	22,42	12,64	5,58	8,64	100,00	98,65
1974	52 585,1	R(000)	114 308	27 151	66	28 114	169 639	86	92 530	48 572	20 617	32 611	364 055	358 768
		C/kWh sold	0,217 4	0,051 6	0,000 1	0,053 5	0,322 6	0,000 2	0,176 0	0,092 4	0,039 2	0,062 0	0,692 3	0,682 2
		% of total cost	31,40	7,46	0,02	7,72	46,60	0,02	25,42	13,34	5,66	8,96	100,00	98,55
1975	57 869,2	R(000)	136 963	30 814	1 400	40 730	209 907	114	141 913	44 980*	18 477*	71 758*	487 149	460 073
		C/kWh sold	0,236 7	0,053 2	0,002 4	0,070 4	0,362 7	0,000 2	0,245 2	0,077 7	0,031 9	0,124 0	0,841 8	0,795 0
		% of total cost	28,12	6,33	0,29	8,36	43,09	0,02	29,13	9,23	3,79	14,73	100,00	94,44
1976	63 355,7	R(000)	173 829	41 470	1 700	53 584	270 583	2 399	208 316	62 477	19 712	92 835	656 322	656 381
		C/kWh sold	0,274 4	0,065 5	0,002 7	0,084 6	0,427 1	0,003 8	0,328 8	0,098 6	0,031 1	0,146 5	1,036 0	1,036 0
		% of total cost	26,49	6,32	0,26	8,16	41,23	0,37	31,74	9,52	3,00	14,14	100,00	100,01
1977	67 125,4	R(000)	224 418	63 403	900	224 000	512 721	15 501	239 228	76 294	19 859	133 494	997 097	1 030 552
		C/kWh sold	0,334 3	0,094 5	0,001 3	0,333 7	0,763 8	0,023 1	0,356 4	0,113 7	0,029 6	0,198 9	1,485 4	1,535 3
		% of total cost	22,51	6,36	0,09	22,47	51,42	1,55	23,99	7,65	1,99	13,39	100,00	103,36

*Basis of allocation changed in 1975.

The integrated generation and transmission system

Statement No. 9

Year	Electrical energy generated			Electrical energy sent out to Escom's transmission system, GWh				Escom generating capacity as at 31 December		*Power station plant load factor (sent-out basis) per cent	Peak demand on integrated Escom system MW	**Integrated Escom system load factor (sent-out basis), per cent	Republic of S.A. total electrical energy sent-out GWh	Escom electrical energy sent out, as percentage of Republic
	†Escom power stations GWh	Total for Republic of S.A. GWh	Escom as percentage of Republic	†From Escom power stations	Purchased by Escom within Republic of S.A.	Imported by Escom from neighbouring territories	Total sent out	Installed rating, MW	Assigned sent-out rating, MW					
1950	7 773,7	11 186,6	69,5	7 286,5	131,4	—	7 417,9	1 440,0	1 290	64,7	†1 182	71,6	†10 437	71,1
1951	8 326,7	11 895,4	70,0	7 806,8	194,6	—	8 001,4	1 520,6	1 361	66,1	†1 212	75,4	†11 098	72,1
1952	8 778,1	12 517,3	70,1	8 227,3	423,9	—	8 651,3	1 624,6	1 454	66,9	†1 265	77,9	†11 678	74,1
1953	9 442,0	13 744,0	68,7	8 845,4	550,4	—	9 395,8	1 825,1	1 635	65,5	†1 394	76,9	†12 823	73,3
1954	10 651,9	15 183,8	70,2	9 977,4	437,3	—	10 414,8	2 052,0	1 846	66,4	†1 570	75,7	†14 167	73,5
1955	12 214,4	17 172,4	71,1	11 425,1	339,3	—	11 764,4	2 378,6	2 145	65,9	†1 806	74,4	†16 021	73,4
1956	13 578,4	18 535,3	73,3	12 669,9	257,2	—	12 927,0	2 764,9	2 498	61,2	†2 001	73,5	†17 293	74,8
1957	14 639,1	20 043,0	73,0	13 640,0	162,8	—	13 802,9	2 826,9	2 555	61,1	†2 151	73,3	18 720	73,7
1958	15 582,6	21 087,3	73,9	14 515,8	164,1	—	14 679,9	3 036,6	2 748	62,0	†2 249	74,5	19 765	74,3
1959	16 926,6	22 488,2	75,3	15 777,1	93,6	—	15 870,7	3 297,0	2 983	62,6	†2 429	74,6	21 021	75,5
1960	18 543,3	24 298,9	76,3	17 307,5	15,3	—	17 322,8	3 416,5	3 091	65,2	†2 605	75,7	22 717	76,3
1961	19 575,4	25 699,7	76,2	18 284,0	8,4	—	18 292,4	3 659,0	3 226	66,2	†2 733	76,4	23 761	77,0
1962	20 805,5	27 457,1	75,8	19 404,1	12,6	—	19 416,7	3 759,0	3 406	65,8	†2 925	75,3	25 599	75,8
1963	22 312,4	29 397,4	75,9	20 793,6	18,6	—	20 812,2	4 176,0	3 788	65,7	†3 183	74,6	27 333	76,1
1964	24 298,5	32 020,0	75,9	22 638,6	41,0	—	22 679,6	4 501,0	4 077	65,2	†3 460	74,6	†29 779	76,2
1965	26 388,2	34 423,2	76,7	24 582,7	126,6	—	24 709,3	4 624,8	4 181	67,4	3 669	76,9	31 939	77,4
1966	27 371,5	36 481,0	75,0	25 504,1	‡629,9	—	26 134,0	4 836,4	4 377	67,1	3 906	76,4	†33 927	77,0
1967	30 421,7	39 636,1	76,8	28 370,9	69,6	—	28 440,5	5 845,4	5 328	66,8	4 227	76,8	36 897	77,1
1968	33 061,2	42 971,0	76,9	30 843,5	7,9	—	30 851,4	6 344,7	5 800	62,9	4 658	75,4	†39 963	77,2
1969	35 966,9	45 968,5	78,2	33 598,2	8,0	—	33 606,2	6 984,7	6 441	62,1	5 055	75,9	42 854	78,4
1970	39 796,2	50 791,0	78,4	37 320,8	7,3	—	37 328,1	7 583,3	7 060	62,9	5 622	75,8	†47 388	78,8
1971	43 472,6	54 647,2	79,6	40 739,4	8,3	—	40 747,7	9 013,3	8 373	61,3	6 115	76,1	51 081	79,8
1972	47 411,1	59 142,0	80,2	44 475,1	9,7	—	44 484,8	9 551,3	8 849	59,6	6 630	76,4	†55 332	80,4
1973	53 039,8	64 390,4	82,4	49 759,1	11,3	—	49 770,4	10 141,5	9 482	62,5	7 350	77,3	60 080	82,8
1974	59 797,5	70 159,0	85,2	56 251,2	7,9	—	56 259,1	10 691,5	10 002	66,3	8 552	75,1	†65 764	85,5
1975	65 479,2	74 888,0	87,4	61 498,4	9,7	25,2	61 533,3	11 241,5	10 522	68,6	9 185	76,5	69 883	88,1
1976	70 287,1	79 358,0	88,6	66 188,1	11,2	1 214,3	67 413,6	12 443,5	11 688	66,8	10 085	76,1	75 381	89,4
1977	70 986,0	80 198,0	88,5	67 050,5	9,1	4 231,9	71 291,5	13 556,0	12 756	61,9	10 735	75,8	†79 276	89,9

†For detailed derivation of this column, see Statement 11, page 76.
‡Includes substantial purchases of GWh from City of Johannesburg during serious drought.
†Estimates based on limited information.

*Power station plant load factor = $\frac{\text{GWh s.o. from all Escom stations}}{\text{aggregate of assigned sent-out capacity hours in year.}}$

**System load factor = $\frac{\text{GWh s.o. on all Escom systems}}{\text{(peak demand on integrated Escom system) × hours in year.}}$

Operations of Escom's coal-fired power stations

Statement No. 10

Year	Generated in coal-fired stations GWh	Sent out from coal-fired stations GWh	Ratio sent out / generated in coal-fired stations	Coal used thousands of tons	Coal used kg per kWh sent out	Calorific value of coal MJ/kg	Station heat rate MJ/kWh sent out	Overall thermal efficiency sent out basis per cent	Coal cost Total R000	Coal cost Rand per ton	Coal cost Cents per kWh sent out	Water used by coal-fired power stations litre/kWhs.o.*
1950	7 763,2	7 276,3	0,937	6 323,4	0,869	22,72	19,74	18,2	5 302,0	0,84	0,072 9	na
1951	8 316,7	7 797,1	0,938	6 662,9	0,855	22,72	19,43	18,5	6 553,0	0,98	0,084 0	na
1952	8 770,0	8 219,8	0,937	7 113,4	0,865	22,75	19,68	18,3	8 520,0	1,20	0,103 7	na
1953	9 434,6	8 838,2	0,937	7 393,9	0,837	23,08	19,32	18,6	9 862,0	1,33	0,111 6	na
1954	10 645,9	9 971,6	0,937	8 024,9	0,805	23,06	18,56	19,4	11 329,0	1,41	0,113 6	na
1955	12 208,2	11 419,1	0,935	8 999,7	0,788	22,89	18,04	20,0	13 709,0	1,52	0,120 1	na
1956	13 571,6	12 663,2	0,933	9 688,5	0,765	22,96	17,56	20,5	13 653,0	1,62	0,123 6	na
1957	14 632,1	13 633,6	0,932	10 220,6	0,750	22,79	17,09	21,1	17 256,0	1,69	0,126 6	na
1958	15 577,1	14 510,5	0,932	10 784,1	0,743	22,73	16,89	21,3	19 039,0	1,77	0,131 2	na
1959	16 923,7	15 774,6	0,932	11 548,7	0,732	22,44	16,43	21,9	20 970,0	1,82	0,132 9	na
1960	18 541,1	17 305,5	0,933	12 512,6	0,723	22,52	16,28	22,1	25 373,0	2,03	0,146 6	na
1961	19 573,4	18 282,2	0,934	13 194,9	0,722	22,39	16,17	22,3	27 713,0	2,10	0,151 6	na
1962	20 802,5	19 401,1	0,933	13 955,5	0,719	22,22	15,98	22,5	29 230,0	2,09	0,150 7	na
1963	22 307,9	20 789,2	0,932	14 721,1	0,708	22,15	15,68	23,0	31 009,0	2,11	0,149 2	na
1964	24 293,8	22 634,1	0,932	15 654,7	0,692	22,15	15,33	23,5	32 367,0	2,07	0,143 0	na
1965	26 388,1	24 582,6	0,932	16 726,7	0,680	22,39	15,23	23,6	34 986,0	2,09	0,142 3	na
1966	27 371,5	25 504,1	0,932	16 982,3	0,666	22,20	14,79	24,4	37 901,0	2,23	0,148 6	na
1967	30 421,7	28 370,9	0,933	18 307,7	0,645	22,44	14,47	24,9	42 053,0	2,30	0,148 2	na
1968	33 061,2	30 843,5	0,933	19 133,9	0,620	22,63	14,03	25,6	44 604,0	2,33	0,144 6	na
1969	35 966,9	33 598,2	0,934	19 982,9	0,595	22,73	13,52	26,6	47 453,0	2,37	0,141 2	3,49
1970	39 796,2	37 320,8	0,938	21 630,6	0,580	22,97	13,32	27,0	48 807,0	2,26	0,130 8	3,25
1971	43 378,8	40 645,8	0,937	23 416,2	0,576	23,30	13,42	26,8	52 705,0	2,25	0,129 7	3,13
1972	46 597,3	43 662,2	0,937	24 952,8	0,571	22,89	13,07	27,5	56 113,0	2,25	0,128 5	2,97
1973	52 849,3	49 569,9	0,938	27 907,9	0,563	22,47	12,65	28,5	66 837,4	2,39	0,134 8	2,86
1974	58 685,5	55 140,9	0,940	30 891,4	0,560	22,42	12,56	28,7	90 268,8	2,92	0,163 7	2,91
1975	64 378,8	60 399,7	0,938	34 231,7	0,567	22,21	12,59	28,6	137 691,7	4,02	0,223,9	2,85
1976	68 405,2	64 309,2	0,940	37 257,4	0,579	21,87	12,66	28,4	**199 029,0	**5,34	**0,309 5	2,87
1977	69 039,7	65 113,8	0,943	37 505,6	0,576	21,78	12,55	25,7	229 937,0	6,12	0,353 2	2,99

*Excludes colliery and construction usage.
**Amended figures.
na = not available.

Electrical energy produced in Escom's power stations

Statement No. 11

Year	Coal-fired steam-electric power stations *GWh		Hydro-electric power stations (conventional dam storage), GWh		Diesel-electric power stations GWh		Gas-turbine electric power stations GWh		Total all Escom generating plant GWh	
	Generated	Sent out	Generated	Sent out	Generated	Sent out	Generated	Sent out	Generated	Sent out
1950	7 763,3	7 276,4	6,7	6,6	3,7	3,5	—	—	7 773,7	7 286,5
1951	8 316,9	7 797,2	6,4	6,3	3,4	3,3	—	—	8 326,7	7 806,8
1952	8 770,1	8 219,7	6,6	6,4	1,4	1,2	—	—	8 778,1	8 227,3
1953	9 434,6	8 838,2	6,7	6,6	0,7	0,6	—	—	9 442,0	8 845,4
1954	10 645,9	9 971,5	5,8	5,7	0,2	0,2	—	—	10 651,9	9 977,4
1955	12 208,2	11 419,1	6,0	5,8	0,2	0,2	—	—	12 214,4	11 425,1
1956	13 571,6	12 663,2	6,5	6,4	0,3	0,3	—	—	13 578,4	12 669,9
1957	14 632,4	13 633,5	6,5	6,3	0,2	0,2	—	—	14 639,1	13 640,0
1958	15 577,1	14 510,5	5,0	4,8	0,5	0,5	—	—	15 582,6	14 515,8
1959	16 923,8	15 774,5	2,7	2,5	0,1	0,1	—	—	16 926,6	15 777,1
1960	18 541,1	17 305,5	2,2	2,0	—	—	—	—	18 543,3	17 307,5
1961	19 573,5	18 282,2	1,9	1,8	—	—	—	—	19 575,4	18 284,0
1962	20 802,5	19 401,2	2,9	2,8	0,1	0,1	—	—	20 805,5	19 404,1
1963	22 307,8	20 789,2	4,5	4,3	0,1	0,1	—	—	22 312,4	20 793,6
1964	24 293,8	22 634,1	4,7	4,5	—	—	—	—	24 298,5	22 638,6
1965	26 388,1	24 582,6	—	—	0,1	0,1	—	—	26 388,2	24 582,7
1966	27 371,5	25 504,1	—	—	—	—	—	—	27 371,5	25 504,1
1967	30 421,7	28 370,9	—	—	—	—	—	—	30 421,7	28 370,9
1968	33 061,2	30 843,5	—	—	—	—	—	—	33 061,2	30 843,5
1969	35 966,9	33 598,2	—	—	—	—	—	—	35 966,9	33 598,2
1970	39 796,2	37 320,8	—	—	—	—	—	—	39 796,2	37 320,8
1971	43 378,8	40 645,8	93,8	93,6	—	—	—	—	43 472,6	40 739,4
1972	46 597,3	43 662,2	813,8	812,9	—	—	—	—	47 411,1	44 475,1
1973	52 849,5	49 569,8	190,3	189,3	—	—	—	—	53 039,8	49 759,1
1974	58 685,6	55 140,9	1 111,9	1 110,3	—	—	—	—	59 797,5	56 251,2
1975	64 378,8	60 399,7	1 100,4	1 098,7	—	—	—	—	65 479,2	61 498,4
1976	68 405,2	64 309,2	1 855,7	1 853,0	—	—	26,2	25,9	70 287,1	66 188,1
1977	69 039,7	65 113,8	1 931,9	1 924,6	—	—	14,4	12,1	70 986,0	67 050,5

*Includes electricity equivalent of compressed air produced by steam-driven compressors, and steam supplied for direct sale (1950 to 1966 inclusive).

Expansion of Escom's transmission and distribution system

Statement No. 12

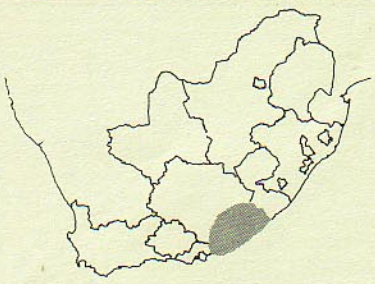
Year	Transmission/Distribution lines: circuit kilometres (excluding service connections on reticulation systems)							Transformers, capacity in service MVA
	533 kV D.C. (Monopolar)	400 kV	275 kV	220 kV	132 kV (including underground cables)	88 kV and below (including underground cables)	Total	
1950	—	—	—	—	203	10 414	10 617	6 137
1951	—	—	—	—	203	11 658	11 861	6 613
1952	—	—	—	—	427	11 880	12 307	7 023
1953	—	—	—	—	734	12 821	13 555	8 374
1954	—	—	—	—	1 051	13 085	14 136	9 663
1955	—	—	—	—	1 437	14 236	15 673	10 931
1956	—	—	—	—	1 727	15 234	16 961	11 997
1957	—	—	—	—	1 838	16 539	18 377	12 104
1958	—	—	—	—	2 274	18 393	20 667	14 346
1959	—	—	315	—	2 689	20 114	23 118	15 665
1960	—	—	315	—	2 778	21 926	25 019	15 987
1961	—	—	315	—	3 782	23 840	27 937	18 730
1962	—	—	648	—	3 853	26 114	30 615	19 265
1963	—	—	875	—	4 052	28 911	33 838	20 059
1964	—	—	1 490	—	4 375	31 898	37 763	22 981
1965	—	—	2 049	—	4 886	34 692	41 627	26 651
1966	—	—	2 194	—	5 387	37 592	45 173	26 814
1967	—	597	2 194	—	5 486	41 258	49 535	28 928
1968	—	597	2 412	—	6 080	44 928	54 017	32 191
1969	—	1 480	2 552	—	6 898	48 922	59 852	39 400
1970	—	1 916	2 599	—	7 063	52 318	63 896	43 007
1971	—	2 503	3 176	—	7 601	55 850	69 130	47 811
1972	—	3 275	3 826	—	8 352	59 860	75 313	52 025
1973	—	4 197	4 255	639	8 942	64 628	82 661	60 581
1974	—	5 040	4 417	639	9 429	68 700	88 225	65 900
1975	1 030	5 099	4 701	639	9 855	72 586	93 910	72 445
1976	1 030	5 745	4 899	761	10 855	77 152	100 442	91 613
1977	1 030	6 231	5 646	1 043	11 321	81 469	106 740	103 846

New headquarters of Escom's Eastern Transvaal Undertaking at Witbank

The distribution undertakings

The development and operation of the separate distribution undertakings are reviewed on the following pages.

BORDER UNDERTAKING



AREA OF SUPPLY..... 55 400 SQUARE KILOMETRES

REFERENCE

Area of Supply.....

E.S.C. Power Stations.....◉WEST BANK

Transmission Lines.....

Transmission Lines Under Construction.....

Ducat's Outspan Substation.....●

International Boundary.....

N

TRANSKEI

BARKLY EAST

MACLEAR

JAMESTOWN

QUMBU

STEYNSBURG

ELLIOT

TSOLO

SCHOOMBIE

MOLTENO

INDWE

CALA

LIBODE

HOFMEYR

STERKSTROOM

UMTATA

LADY FRERE

ENGCOBO

NGOELENI

QUEENSTOWN

MQANDULI

TARKASTAD

QAMATA

ELLIOTDALE

TSOMO

TYLDEN

CRADOCK

IDUTYWA

WHITTLESEA

NQAMAKWE

HYDRA

CATHCART

WILLOWVALE

BUTTERWORTH

SEYMOUR

KENTANI

STUTTERHEIM

KUBUSI

KOMGA

BEDFORD

MT KEMP

ADELAIDE

BLINKWATER

FORT BEAUFORT

ALICE

FORT COX

DIMBAZA

KEI ROAD

KEIMOUTH

POSEIDON

MIDDLEDRIFT

MACLEAN TOWN

KOONAP FARMERS

PEMBROKE

ALOE GLEN

DUCATS

KING WILLIAM'S TOWN

BERLIN

GOOD HOPE TEXTILE S.S.

GOOD RICHO

GONUBIE

BEACON BAY

BUFFALO

WEST BANK

EAST LONDON

PORT REX

BREAKFAST VLEI

PROSPECT

KIDDS BEACH

RIEBEEK EAST

PEDDIE

WOOLDRIDGE

ALBANY

BELL

HAMBURG

GRAHAMSTOWN

ALICEDALE

PATERSON

GRASSRIDGE

BATHURST

GREAT FISH POINT LIGHTHOUSE

KARIEGA

ALEXANDRIA

PORT ALFRED

PORT ELIZABETH

INDIAN OCEAN

10 0 10 20 30 40 50 60 70 80 90 100 KILOMETRES

Border Undertaking

The map shows the licensed area of supply of this Undertaking at 31 December 1977.

Sales of electricity

The sales in this Undertaking during 1977, as indicated in the accompanying table, amounted to 727 million kWh, an increase of 7,8 per cent on the sales in the previous year (12,9 per cent in 1976).

In this Undertaking, bulk municipal sales constitute some 89 per cent of the total sales, the supplies to East London Municipality alone having accounted for 60,1 per cent of the total sales in 1977.

Bulk supplies to East London increased during the year by 2,2 per cent, compared with an increase of 8,6 per cent recorded in 1976. Total bulk sales to all municipalities in the Undertaking increased during 1977 by 7,9 per cent, which is appreciably below the rate of 14,0 per cent recorded for this category in 1976. This is still a relatively high growth rate, and can be attributed to a continuation of the rapid growth experienced in the Escom supply to centres such as Queenstown and Umtata where increases of 42 per cent and 36 per cent respectively were recorded for the year.

Development of the Undertaking

With the installation of new equipment in November 1977 at Kelvin Grove, this substation now forms the main distribution point for the reticulation of Beacon Bay, while Gonubie substation will form the main distribution point for the reticulation of Gonubie after new equipment is put in service early in 1978.

Whilst construction of a 66/11 kV substation with two 10 MVA transformers at Dimbaza will be completed early in 1978, the erection of a 22/11 kV substation at Cathcart has been indefinitely deferred. However, 11 kV voltage regulators were installed on the system to improve voltage levels.

Two 220/132 kV 240 MVA transformers were installed at Pembroke substation near Berlin. The Aloe Glen substation was commissioned in June 1977 and Royston substation in October. Erection of the two 66/22 kV 5 MVA and two 22/11 kV 5 MVA transformers at Kubusie substation near Stutterheim was completed in June 1977 and extensions to this substation are now complete. With the installation of additional transformers at Kwaaihoek and Station Hill in March and July 1977 respectively, and the erection of 27 km of 22 kV line from Kariega substation to Kwaaihoek substation near Alexandria in November 1977, reinforcement of the supply to the Port Alfred and Alexandria areas was completed.

The construction of 118 km of 132 kV line from Pembroke to Albany substation near Grahamstown is underway. Supplies to the North Coast system was reinforced with the completion of 12 km of 66 kV line from Aloe Glen substation to Greenacres and Royston substations. Survey work is in hand for the construction of a 66 kV line from Dimbaza to Amatola substation near Keiskammahoek where a single 66/11 kV 5 MVA transformer will initially be installed.

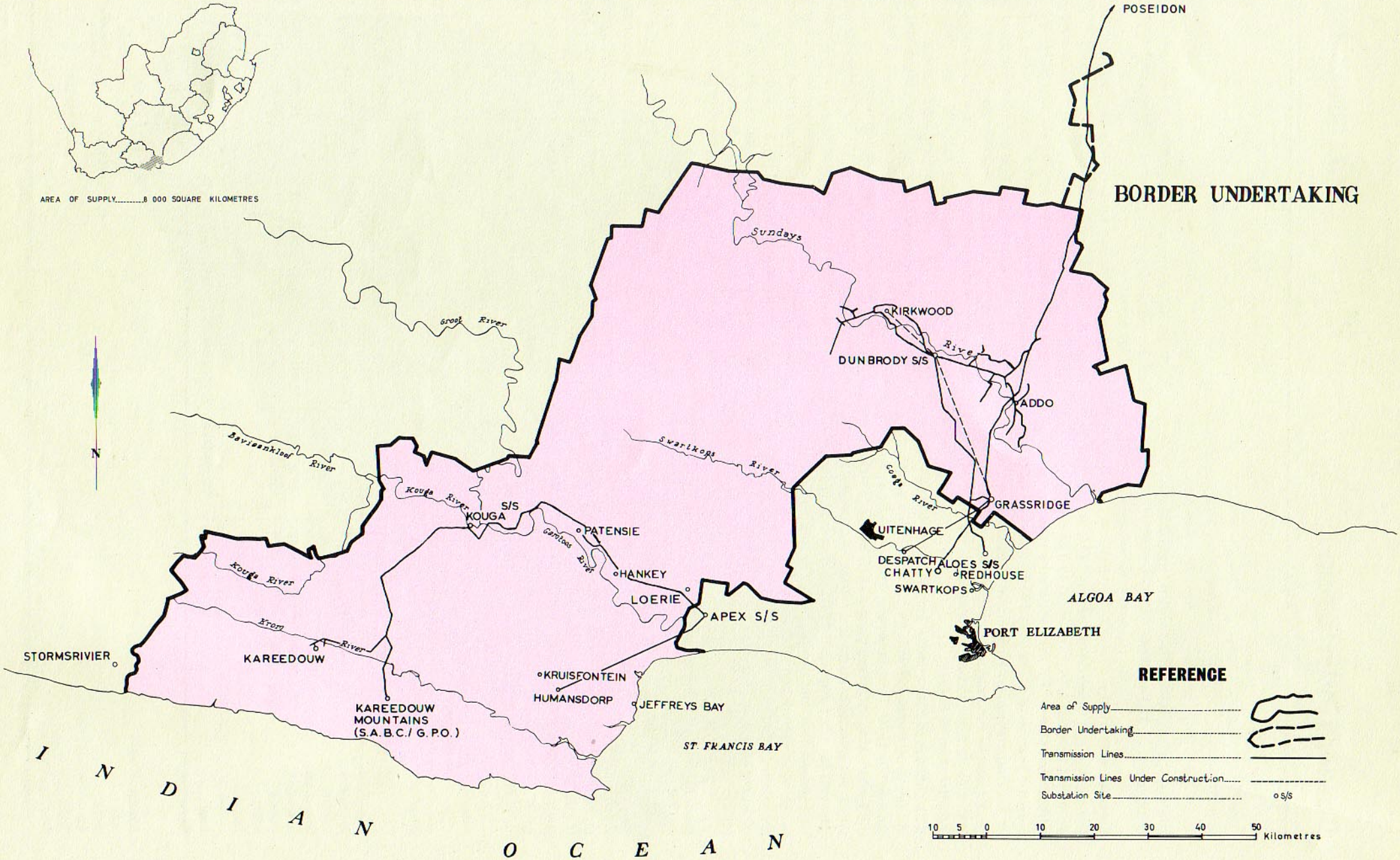
Financial

The Undertaking's financial results for 1977 are shown in the table. The average price of 2,914 6 cents per kWh sold during 1977 is 40,1 per cent higher than the figure for the preceding year (24,9 per cent in 1976). Total sales revenue for the year amounted to R21 198 944 and exceeded the corresponding figure for the preceding year by 51,0 per cent (41,0 per cent in 1976).

Consumer details			Sales of electricity						Revenue from sales in Rand		Average price in cents per kWh sold	
Category	Number		Per cent of total		kWh sold		Per cent change					
	1976	**1977**	1976	**1977**	1976	**1977**	76/75	**77/76**	1976	**1977**	1976	**1977**
Bulk supplies	19	**19**	88,52	**88,59**	597 339 680	**644 342 182**	+14,03	**+ 7,87**	**11 527 089**	**17 390 784**	1,929 7	**2,699 0**
Direct supplies:												
Domestic and street lighting	4 146	**3 898**	4,57	**4,12**	30 858 017	**29 937 326**	− 1,19	**− 2,98**	1 126 056	**1 515 386**	3,649 2	**5,061 9**
Industrial	507	**976**	6,91	**7,29**	46 652 263	**53 046 206**	+ 9,59	**+13,71**	1 382 050	**2 292 774**	2,962 5	**4,322 2**
Mining	—	—	—	—	—	—	—	—	—	—	—	—
Traction	—	—	—	—	—	—	—	—	—	—	—	—
Total	4 672	**4 893**	100,00	**100,00**	674 849 960	**727 325 714**	+12,92	**+ 7,77**	14 035 195	**21 198 944**	2,079 8	**2,914 6**

	1976	**1977**	
	R	**R**	
Expenditure charged	14 608 725	**18 877 868**	
Surplus	—	**2 321 076**	**Border Undertaking**
Deficit	573 530	—	
Accumulated to 31 December:			
Surplus	—	**284 597**	
Deficit	2 036 479	—	

CAPE EASTERN UNDERTAKING



Cape Eastern Undertaking

The map shows the licensed area of supply of the Undertaking at 31 December 1977.

Sales of electricity

Electricity sales in this Undertaking amounted to 22 million kWh in 1977, 57,0 per cent more than in the preceding year (4,8 per cent in 1976). This very rapid growth is due mainly to the 226,2 per cent increase in the bulk sales category (11,6 per cent in 1976) after Humansdorp started taking supplies during the year. Significant growth was also recorded in the industrial sector (24,6 per cent, as opposed to 6,9 per cent in 1976). Bulk supplies now constitute 38,0 per cent of the Undertaking's overall sales (18,3 per cent in 1976) while industrial sales amount to 43,8 per cent (55,3 per cent in 1976).

Development of the Undertaking

The construction of 24 km of 132 kV line from Apex substation near Summit to a point 5 km from Humansdorp, and the installation of two 66/22 kV 10 MVA transformers at Apex substation were completed in July 1977. These extensions enabled Humansdorp Municipality to receive a supply in the same month. The 132 kV line is initially operated at 22 kV. Means of reinforcing supplies to the Humansdorp area to cater for future load growth and to meet a request for possible supplies along the coast between Sea Vista and Cape St. Francis, are being investigated.

Two 22/11 kV 5 MVA transformers were installed at Dunbrody substation in the Sundays River Valley. Commissioning was completed in November 1977. In addition, a line bay was erected and a small section of line deviated into Dunbrody substation to improve supplies to the Addo area.

Construction of 33 km of 22 kV line from Grassridge substation to Dunbrody substation and 13 km of 22 kV line from Dunbrody substation to Kirkwood substation in the Sundays River Valley is progressing.

Design work is in hand for the installation of a 22 kV 2,5 MVA voltage regulator at Kouga substation near Paul Sauer Dam. This will improve supplies to the Kareedouw area when the set is installed in the second quarter of 1978.

As far as communication links are concerned, work commenced on improving communication with Pembroke regional control centre near Berlin by means of power line carrier and radio links, and at Glenmere a site has been selected for the erection of an additional radio repeater station.

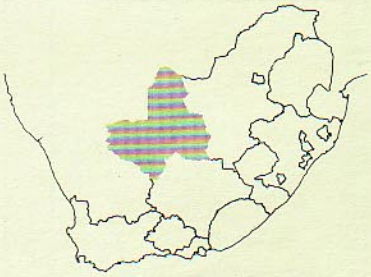
Financial

The Undertaking's financial results for 1977 are shown in the table. The average price of 4,919 1 cents per kWh sold during 1977 is 11,5 per cent higher than the figure for the preceding year (23,1 per cent in 1976). Total sales revenue for the year amounted to R1 093 633 and exceeded the corresponding figure for the preceding year by 75,4 per cent (29,9 per cent in 1976).

Consumer details			Sales of electricity						Revenue from sales in Rand		Average price in cents per kWh sold	
Category	Number		Per cent of total		kWh sold		Per cent change					
	1976	**1977**	1976	**1977**	1976	**1977**	76/75	**77/76**	1976	**1977**	1976	**1977**
Bulk supplies	1	**2**	18,33	**38,00**	2 590 320	**8 448 680**	+11,63	**+226,16**	61 800	**222 348**	2,385 8	**2,631 7**
Direct supplies:												
Domestic and street lighting	658	**638**	26,34	**18,20**	3 722 642	**4 045 637**	− 3,24	+ **8,68**	199 176	**350 935**	5,350 4	**8,674 4**
Industrial	292	**293**	55,33	**43,80**	7 817 969	**9 738 012**	+ 6,89	+ **24,56**	362 597	**520 350**	4,638 0	**5,343 5**
Mining	—	—	—	—	—	—	—	—	—	—	—	—
Traction	—	—	—	—	—	—	—	—	—	—	—	—
Total	951	**933**	100,00	**100,00**	14 130 931	**22 232 329**	+ 4,82	+ **57,33**	623 573	**1 093 633**	4,412 8	**4,919 1**

	1976	**1977**	
	R	**R**	
Expenditure charged	631 212	**989 857**	**Cape Eastern Undertaking**
Surplus	—	**103 776**	
Deficit	7 639	—	
Accumulated to 31 December:			
Surplus	—	—	
Deficit	348 843	**245 067**	

CAPE NORTHERN UNDERTAKING



AREA OF SUPPLY..... 147 400 SQUARE KILOMETRES

REFERENCE

AREA OF SUPPLY.....

TRANSMISSION LINES.....

TRANSMISSION LINES UNDER CONSTRUCTION.....

BOTSWANA

N

BOPHUTHATSWANA

Molopo

POMFRET
VESEL

BOPHUTHATSWANA

BOPHUTHATSWANA

VRYBURG

WESSELS
BLACK ROCK
KLIPKOP
HOTAZEL
DEVONIA
MIDDELPLAATS
ADAMS
MAMATWAN
CORETSI
ELDORET
RIRIES
MOTHIBISTAT
KURUMAN
ASBES
CORHEIM
STRELLEY
VALLEY
DIBENG
KATHU
BOSRAND
Sishen
FERRUM
BRETBY
GAKAROSA F.M. STATION
GREYLING
LYLYVELD
GRYPPOORT
KLIPFONTEIN
NOORDHOEK
OLIFANTSHOEK
LOHATLHA
MANGANORE
TURNER
MANCORP
BEESHOEK
POSTMASBURG
HILLSIDE
VAALBOS
FINSCH MINE
DANIELSKUIL
OUPLAAS
WELCOMEWOOD
LIMEACRES
OLIEN
SILVERSTREAMS
REIVILO
NORLIM
TAUNGS
MAGOGONG
HARTSWATER
TADCASTER
GANSPAN
JANKEMP
GROOTPLAAS F.M. STATION
BOETSAP
CHRISTIANA
BLOEMHEUWEL
VIERFONTEIN
BELLSBANK
KOOPMANSFONTEIN
KNEUKEL
DILCOR
HOLPAN
DELPORTSHOOP
BORRELSKOP
WINDSORTON
WINDSORTON ROAD MIC.
WARRENTON
WINTERSHOEK MIC.
GROOTKOP
GANNAVLAKTE
BARKLY WEST
RIVERTON
BOSHOF
DAMPLAAS
NEW ELANDS
BOSPLAAT
LOXTON MINE
PERSEUS
DE ALESVILLE
WOLWEDAM MIC
KIMBERLEY
BOUNDARY
OLIFANTSKOP F.M. STATION
UITKYK MIC
KLAARWATER MIC.
Vaal
Riet
Modder
PAARDEBERG
RITCHIE
DOUGLAS
WITBERG MIC
JACOBSDAL
PETRUSBURG
BERGDAM F.M. STATION
SALT LAKE
KOFFIEFONTEIN
HOPETOWN
LUCKHOFF
FAURESMITH
JAGERSFONTEIN
Orange
PETRUSVILLE
HYDRA
LOCKSHOEK MIC.
KAALKOL MIC.
GRIQUATOWN
UPINGTON
ROOIBERG MIC
ZANDDAM MIC
AUGRABIES
KEIMOES
KAKAMAS
GROOTDRINK
WYNKELDER
GARIEP
PADKLOOF MIC
KLEINBEGIN F.M.
KLEINBEGIN
ROOISAND MIC.
Orange
KENHARDT
AGGENEIS
ARIES
FIBRE
KOEGAS
MARYDALE
BRAKBOS
F.M. STATION No. C 46
PRIESKA MIC
PRIESKA
CUPRUM
AKRONOS
HYDRA
HYDRA

10 0 10 20 30 40 50 60 70 80 90 100 KILOMETRES

Cape Northern Undertaking

The map shows the licensed area of supply of the Undertaking at 31 December 1977.

Sales of electricity

The sales in this Undertaking during 1977, as indicated in the accompanying table, were 1 668 million kWh, an increase of 10,7 per cent on the sales in the previous year (12,4 per cent in 1976).

The mining sector continued to increase its dominance of the total sales. The highest growth rate was in respect of iron (67,8 per cent), followed by gypsum and lime (57,8 per cent), manganese (24,6 per cent), asbestos (19,5 per cent), and copper (5,3 per cent). Diamond mining showed a negative rate of 2,4 per cent. The total mining sales increased by 21,7 per cent in 1977; significantly higher than the 1976 figure of 16,5 per cent.

Bulk supplies experienced a growth rate of 8,4 per cent (12,6 per cent in 1976).

The industrial sector, accounting for 7,2 per cent of the total sales, showed a negative rate of growth of 2,4 per cent. The negative rate of growth of 7,9 per cent in traction supplies can be attributed to the fact that mainly diesel engines were used on the Sishen-Saldanha railway line during 1977.

Development of the Undertaking

Associated Manganese requested Escom to make provision for a load increase from their present 2,5 MVA to 7,5 MVA at their Mancorp mine in 1978, and accordingly a 132/22 kV substation with two 10 MVA transformers was completed in November 1977. To improve voltage conditions on the existing 22 kV system serving the Jacobsdal area and to provide increased security of supply, a 132/22 kV substation with one 10 MVA transformer was commissioned in the first half of 1977. At the De Beers Koffiefontein diamond mine the two existing 7,5 MVA transformers were replaced by two 132/66 kV 20 MVA transformers.

A permanent 30 MVA supply is to be furnished to the O'Okiep Copper Company from Nama substation in March 1978. At about the same time Escom will take over from the O'Okiep Copper Company the 1,2 MVA supply to Springbok Municipality and the 3 MVA supply to the Department of Water Affairs for the Doringwater pumping scheme which supplies water in bulk from the Orange River to the Springbok mining area.

The 275 kV reinforcement to the Kimberley-Sishen system was completed when the two 275/132 kV substations, Olien and Ferrum, were commissioned during the first quarter of 1977. This reinforcement now provides Iscor with an ample and secure supply and will similarly serve the northern section of the Sishen-Saldanha rail link when this is electrified during the first half of 1978. The 275 kV line from Ferrum to Gariep and the Gariep 275/50 kV substation have already been completed and will be commissioned as soon as the South African Railways are ready to accept supply.

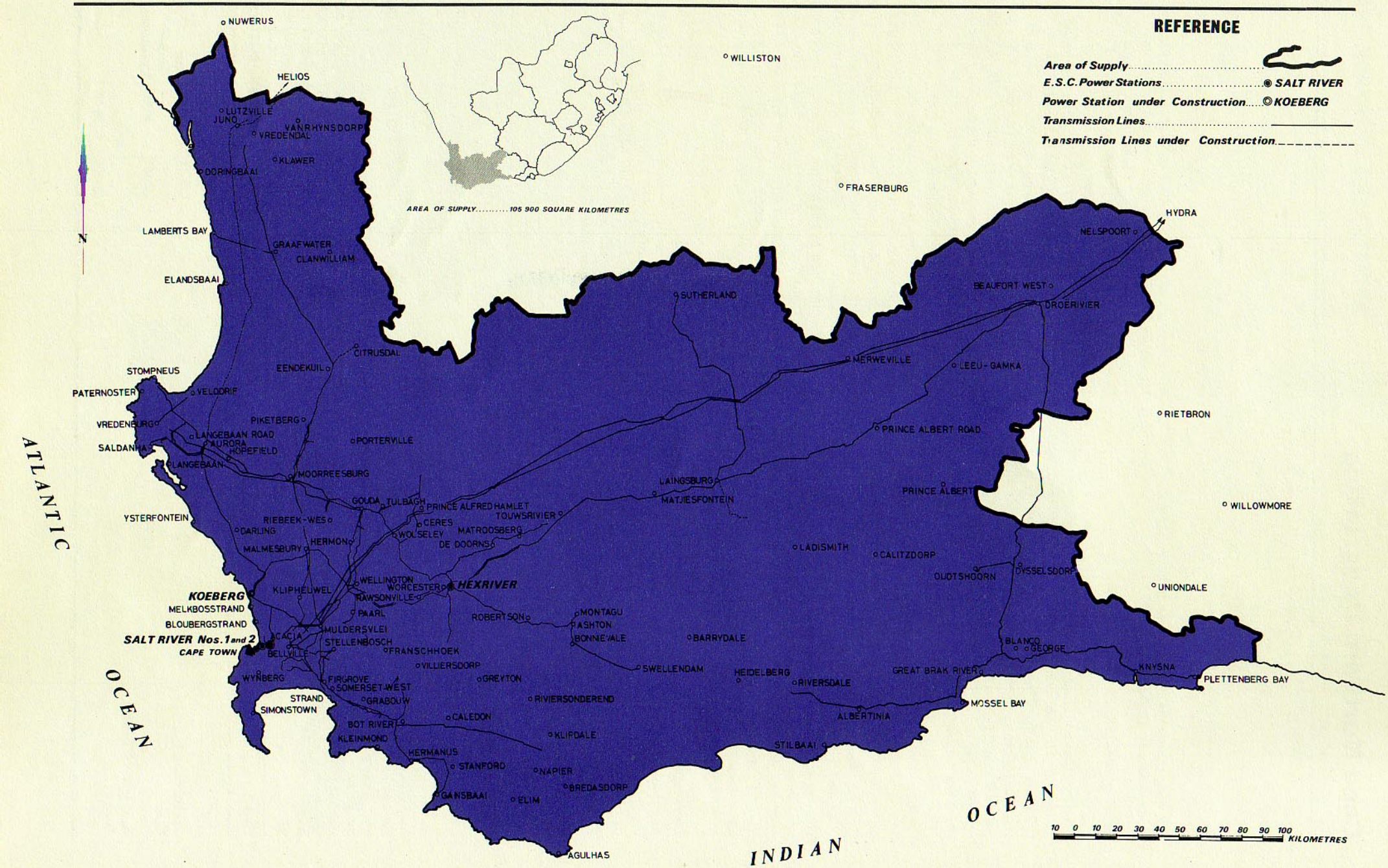
Financial

The Undertaking's financial results for 1977 are shown in the table. The average price of 2,093 7 cents per kWh sold during 1977 is 45,0 per cent higher than the figure for the preceding year (25,0 per cent in 1976). Total sales revenue for the year amounted to R34 922 290 and exceeded the corresponding figure for the preceding year by 60,5 per cent (40,6 per cent in 1976).

Consumer details			Sales of electricity						Revenue from sales in Rand		Average price in cents per kWh sold	
Category	Number		Per cent of total		kWh sold		Per cent change					
	1976	**1977**	1976	**1977**	1976	**1977**	76/75	**77/76**	1976	**1977**	1976	**1977**
Bulk supplies	29	**30**	22,32	**21,86**	336 310 505	**364 616 201**	+12,59	**+ 8,42**	4 528 223	**7 021 819**	1,346 4	**1,925 8**
Direct supplies:												
Domestic and street lighting	3 099	**3 243**	1,77	**1,72**	26 734 896	**28 735 285**	+ 2,06	**+ 7,48**	636 115	**935 484**	2,379 3	**3,255 5**
Industrial	966	**981**	8,20	**7,22**	123 487 541	**120 483 832**	+ 3,62	**− 2,43**	2 333 573	**3 376 850**	1,889 7	**2,802 7**
Mining	77	**77**	48,14	**52,92**	725 268 485	**882 659 765**	+16,53	**+21,70**	10 013 096	**17 447 618**	1,380 6	**1,976 7**
Traction	3	**3**	19,57	**16,28**	294 895 030	**271 504 656**	+ 7,67	**− 7,93**	4 245 332	**6 140 519**	1,439 6	**2,261 7**
Total	4 174	**4 334**	100,00	**100,00**	1 506 696 457	**1 667 999 739**	+12,41	**+10,71**	21 756 339	**34 922 290**	1,444 0	**2,093 7**

	1976 R	**1977 R**	
Expenditure charged	22 517 374	**35 016 755**	**Cape Northern Undertaking**
Surplus	—	—	
Deficit	761 035	**94 465**	
Accumulated to 31 December:			
Surplus	—	—	
Deficit	2 034 536	**2 129 001**	

CAPE WESTERN UNDERTAKING



Cape Western Undertaking

The map shows the licensed area of supply of this Undertaking at 31 December 1977.

Sales of electricity

Total sales in the Undertaking, as indicated by the accompanying table, increased by 2,0 per cent from 4 930 million kWh in 1976 to 5 028 in 1977. This increase was less than the rate of 5,9 per cent attained in 1976 and continued the downward trend experienced since 1975. The bulk sales to Cape Town increased in 1977 by 5,2 per cent, a figure slightly higher than the 4,6 per cent growth of 1976. Of the sales for 1977, Cape Town alone accounted for 35,5 per cent of the Undertaking's total.

Bulk supplies to all municipalities in this Undertaking constituted 52,9 per cent of the total sales. Bulk sales, excluding sales to Cape Town, reached 875 million kWh in 1977. This is 3,6 per cent more than the sales in the preceding year (10,6 per cent in 1976).

Development of the Undertaking

During the year a backlog of reticulation work was reduced.

Several substations were erected, such as the 66/11 kV substation, Vlakte, with two 20 MVA transformers which was erected and commissioned, together with its associated line/cable feeders from Blackheath, in the Philippi area to cope with industrial load growth. The Blouwater substation near Langebaan was completed so that the Iscor ore loading facility at Saldanha could be linked to the Undertaking's 132 kV transmission network. The erection of the Muldersvlei-Aurora 400 kV line and Aurora substation was completed by the end of the year, and early in 1978 Aurora will supply Blouwater at 132 kV and have a 50 kV supply available at Saldanha for the Sishen-Saldanha railway electrification.

The Dassenberg substation, on the 132 kV line from Malmesbury to Duine (the Koeberg construction substation), was completed and commissioned, giving supply to Atlantis at 11 kV. Work is progressing on the 33 kV section of the substation; this is the ultimate supply voltage. One of the two 400 kV Muldersvlei-Acacia transmission lines was completed, as was most of the Acacia 400 kV substation. One 400/132 kV 500 MVA transformer was commissioned at this substation.

A double circuit 132 kV line and a 132 kV cable were completed and commissioned from Stikland to Sarepta substation, making a 132 kV supply available to S.A. Nylon Spinners.

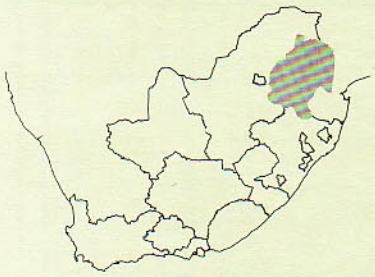
Financial

The Undertaking's financial results for 1977 are shown in the table. The average price of 2,227 1 cents per kWh sold during 1977 is 50,0 per cent higher than the figure for the preceding year (23,7 per cent in 1976). Total sales revenue for the year amounted to R111 983 891 and exceeded the corresponding figure for the preceding year by 53,0 per cent (31,0 per cent in 1976).

Consumer details			Sales of electricity						Revenue from sales in Rand		Average price in cents per kWh sold	
Category	Number		Per cent of total		kWh sold		Per cent change					
	1976	**1977**	1976	**1977**	1976	**1977**	76/75	**77/76**	1976	**1977**	1976	**1977**
Bulk supplies	56	**57**	51,49	**52,85**	2 538 896 006	**2 657 539 507**	+6,53	**+ 4,67**	29 033 474	**44 122 788**	1,143 5	**1,660 3**
Direct supplies:												
Domestic and street lighting	59 474	**59 990**	9,78	**8,26**	482 012 267	**415 144 757**	+6,58	**−13,87**	10 928 622	**16 509 079**	2,267 3	**3,976 7**
Industrial	16 542	**16 151**	28,85	**29,70**	1 422 540 958	**1 493 572 014**	+8,25	**+ 4,99**	25 306 756	**40 044 740**	1,779 0	**2,681 1**
Mining	—	**—**	—	**—**	—	**—**	—	**—**	—	**—**	—	**—**
Traction	6	**6**	9,88	**9,19**	486 928 120	**461 946 636**	−3,75	**− 5,13**	7 926 292	**11 307 284**	1,627 8	**2,447 7**
Total	76 078	**76 204**	100,00	**100,00**	4 930 377 351	**5 028 202 914**	+5,90	**+ 1,98**	73 195 144	**111 983 891**	1,484 6	**2,227 1**

	1976 R	**1977 R**	
Expenditure charged	73 102 300	**100 998 628**	**Cape Western Undertaking**
Surplus	92 844	**10 985 263**	
Deficit	—	**—**	
Accumulated to 31 December:			
Surplus	—	**5 450 071**	
Deficit	5 535 192	**—**	

EASTERN TRANSVAAL UNDERTAKING



AREA OF SUPPLY.....97 600 SQUARE KILOMETRES

REFERENCE

Area of Supply.....

E.S.C. Power Stations.....◉ HENDRINA.....◎ MATLA (Under Construction)

Transmission Lines.....

Transmission Lines Under Construction.....

CABORA BASSA
SOEKMEKAAR
MUNNIK
DUIWELSKLOOF
TZANEEN
HAENERTSBURG
PIETERSBURG
N
WITKOP
MIDDELPUNT
PENGE
OFCOLACO
GRAVELOTTE
LEYDSDORP
SELATI
PHALABORWA
FOSKOR
LETABA
OLIFANTSKAMP
MICA
HOEDSPRUIT
KLASERIE
SATARA
STEELPOORT
SEKHUKUNE
BURGERSFORT
MERENSKY
ACORNHOEK
BOPHUTHATSWANA
KENNEDYSVALE
NEBO
MARBLE HALL
GRASKOP
LYDENBURG
GORGE
SKUKUZA
GROBLERSDAL
ROOSSENEKAL
MAPOCH
SABIE
KIEPERSOL
LOWER SABIE
DENNILTON
BOSOORD
PRETORIUSKOP
BRONDAL
PLASTON
Park
LOSKOPDAM
DULLSTROOM
STOFFBERG
ROOIKOP
MARATHON
KOMATIPOORT
SAMOZ
BAMBI
PALMER
NELSPRUIT
MALELANE
WAPAD
KAAPSCHE HOOP
BOULDERS
SAPPI
BELFAST
NASARET
PAN
MACHADODORP
NOORDKAAP
LOUWS CREEK
LOMATI
BRONKHORSTSPRUIT
APOLLO
VULCAN
MIDDELBURG
ROCKDALE
PRAIRIE
BOSLOOP
BARBERTON
H.S.V.
TRANSALLOYS
WITBANK
DUVHA
WONDERFONTEIN
KAFFERSKRAAL
WILGE
ARNOT
WITKLOOF
BLACKHILL
WINTERSHOEK
STERKSPRUIT
ARBOR
BADPLAAS
HENDRINA
CAROLINA
KENDAL
OGIES
KOMATI
MZAULI
LOCHIEL
MIDDELDRIFT
HENDRINA
NEVIS
KRUISPUNT
KRIEL
OSHOEK
DEVON
LESLIE
MATLA
BREYTEN
JESSIEVALE
KINROSS
ESTANCIA
LAKE CHRISSIE
MBABANE
EENDRACHT
WILDEBEES
DAVEL
LOTHAIR
TRICHARDT
BETHAL
SOL
OOSSKAG
ERMELO
ROODEBANK
WESSKAG
ZEUS
CHARLCILLIERS
AMSTERDAM
ATLAS
CAMDEN
JERICHO
SWAZILAND
MORGENZON
PANBULT
ISWEPE
KEMP
CHIVELSTON
PIET RETIEF
NORMANDIE
UMFOLOZI
MOÇAMBIQUE

10 0 10 20 30 40 50 60 70 80 90 100 KILOMETRES

Eastern Transvaal Undertaking

The map shows the licensed area of supply of this Undertaking at 31 December 1977.

Sales of electricity

Sales of electricity in this Undertaking, as indicated in the accompanying table, increased by 12,9 per cent from 8 028 million kWh in 1976 to 9 262 in 1977, a rate of growth somewhat higher than the 10,5 per cent recorded in 1976.

The industrial category continued to dominate the total sales of the Undertaking, and an increase of 13,8 per cent was achieved (12,2 per cent in 1976). This sustained growth was due mainly to new supplies to the ferro-chrome plant at Tubatse and Consolidated Metallurgical Industries near Lydenburg. Mining sales showed a growth of 13,7 per cent (8,2 per cent in 1976). In this category, a growth rate of 19,4 per cent was achieved in sales to coal mines (18,2 per cent in 1976), while sales to copper mines increased by 27,9 per cent (8,9 per cent in 1976). Sales to gold mines, which showed negative growth in 1975 (−1,2 per cent) and in 1976 (−1,1 per cent), increased by 1,5 per cent in 1977.

The domestic and street lighting category, which constitutes 0,3 per cent of the Undertaking's total sales, showed a negative growth of 20,2 per cent (+22,3 per cent in 1976). This trend emerged in various undertakings during the year and follows the reorganisation of the accounting systems used by Undertakings whereby some domestic consumers, mainly in the rural areas, were relocated in the industrial sales category.

Development of the Undertaking

A new substation was completed at Davel with two 88/11 kV 3,5 MVA transformers in service and nearby Genmin substation was commissioned. Adjacent to Witbank the new Greenside substation was commissioned with two 132/22 kV 40 MVA transformers in service, supplying numerous coal mines in the district.

Two 132 kV lines, each 14,3 km long, were commissioned from Kudu substation near Komati power station to a temporary 132 kV busbar on the Duvhacol substation site. Duvhacol will be providing supplies to Duvha Colliery, associated with the new Duvha power station. An additional 132 kV line (13,5 km long) was taken from the temporary Duvhacol busbar to Duvha power station.

Continued progress was made with the provision of traction supplies: 150 km of 132 kV and 50 km of 88 kV railway line were commissioned together with seventeen 132 kV traction substations and twelve 88 kV traction substations. Several traction projects are as yet incomplete.

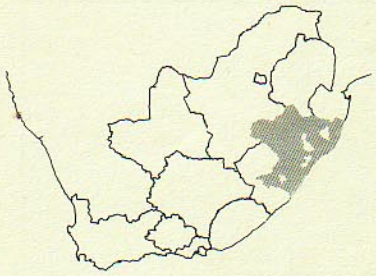
Financial

The Undertaking's financial results for 1977 are shown in the table. The average price of 1,400 1 cents per kWh sold during 1977 is 43,5 per cent higher than the figure for the preceding year (28,0 per cent in 1976). Total sales revenue for the year amounted to R126 881 496 and exceeded the corresponding figure for the preceding year by 62,0 per cent (41,4 per cent in 1976).

Consumer details			Sales of electricity						Revenue from sales in Rand		Average price in cents per kWh sold	
Category	Number		Per cent of total		kWh sold		Per cent change					
	1976	**1977**	1976	**1977**	1976	**1977**	76/75	**77/76**	1976	**1977**	1976	**1977**
Bulk supplies	32	**32**	10,49	**9,99**	842 466 967	**904 874 826**	+ 9,69	**+ 7,41**	8 486 180	**13 083 532**	1,007 3	**1,445 9**
Direct supplies:												
Domestic and street lighting	2 975	**2 420**	0,45	**0,32**	36 438 634	**29 089 420**	+22,30	**−20,17**	678 354	**731 471**	1,861 6	**2,514 6**
Industrial	6 319	**7 297**	61,05	**61,57**	4 901 397 250	**5 579 472 269**	+12,23	**+13,83**	46 036 443	**75 662 760**	0,938 6	**1,356 1**
Mining	119	**127**	23,29	**23,45**	1 869 415 811	**2 125 672 143**	+ 8,15	**+13,71**	18 223 742	**29 199 297**	0,974 8	**1,373 7**
Traction	8	**12**	4,72	**4,67**	378 630 299	**423 116 496**	+ 1,43	**+11,75**	4 912 343	**8 204 436**	1,297 4	**1,939 0**
Total	9 453	**9 888**	100,00	**100,00**	8 028 348 961	**9 062 225 154**	+10,48	**+12,88**	78 337 062	**126 881 496**	0,975 8	**1,400 1**

	1976	**1977**	
	R	**R**	
Expenditure charged	77 433 472	**131 281 372**	**Eastern Transvaal Undertaking**
Surplus	903 590	—	
Deficit	—	**4 399 876**	
Accumulated to 31 December:			
Surplus	—	—	
Deficit	1 059 995	**5 459 872**	

NATAL UNDERTAKING



AREA OF SUPPLY..... 106 700 SQUARE KILOMETRES

REFERENCE

Area of Supply

E.S.C. Power Stations ◉ INGAGANE

E.S.C. Power Station under Construction ○ DRAKENSBERG

Transmission Lines

Transmission Lines under Construction

Provincial Boundaries

International Boundaries

Transvaal

MOCAMBIQUE

SWAZILAND

Orange Free State

LESOTHO

TRANSKEI

Natal

INDIAN OCEAN

CAMDEN
AMERSFOORT
STANDERTON
PLATRAND
PERDEKOP
SANDSPRUIT
HEILBRON
FRANKFORT
VOLKSRUST
VREDE
PIET RETIEF
NORMANDIE
WAKKERSTROOM
PAUL PIETERSBURG
PONGOLA
LOUWSBURG
PETRUS STEYN
MEMEL
INCANDU
UTRECHT
CORONATION
KLOBANE
MKUZE
REITZ
LINDLEY
WARDEN
NEWCASTLE
VRYHEID
NGWIBI
KOMSPRUIT
ARLINGTON
INGAGANE
CHIVELSTON
BLOEDRIVIER
BETHLEHEM
AFRIKASKOP
RUSTON
HLUHLUWE
SENEKAL
PAUL ROUX
KESTELL
HARRISMITH
GLENCOE
DUNDEE
UMFOLOZI
ULUNDI
STERKFONTEIN
GOLDEN GATE
CLARENS
VAN REENEN
WITZIESHOEK
DRAKENSBERG
TUGELA
DANSKRAAL
LADYSMITH
MTUBATUBA
ST. LUCIA
FOURIESBURG
JOELSDRIFT
ROYAL NATAL NATIONAL PARK
ORIEL
BERGVILLE
COLENSO
BLOUKRANS
MELMOTH
KWAMBONAMBI
MHLATUZE
RABBIT
NKWALENI
INVUBU
EMPANGENI
IMPALA
RICHARD'S BAY
ALUSAF
WINTERTON
CATHEDRAL PEAK
WEENEN
ESHOWE
MBONYOLWANA
GINGINDLOVU
MTUNZINI
ESTCOURT
CHAMPAGNE CASTLE
MUDEN
KRANSKOP
GREYTOWN
AHRENS
RIETVLEI
MOOI RIVER
SEVEN OAKS
MANDINI
DALTON
GLENDALE
GLENSIDE
STANGER
MERSEY
WARTBURG
HOWICK
CEDARA
DRIEFONTEIN
SHAKASKRAAL
IMPENDHLE
PIETERMARITZBURG
TONGAAT
THORNVILLE
CATO RIDGE
UNDERBERG
BULWER
GEORGEDALE
UMGENI
DURBAN
CONGELLA
DONNYBROOK
RICHMOND
ESTON
KLAARWATER
CREIGHTON
UMLAZI
REUNION
Cape Province
TRANSKEI
Transkei
UMBUMBULU
ILLOVO
IXOPO
MATATIELE
HIGHFLATS
UMKOMAAS
UMZIMKULU
UMZINTO
CEDARVILLE
KELSO
KOKSTAD
HARDING
HIBBERDENE
WEZA
MOUNT FLETCHER
MOUNT AYLIFF
MARBURG
PORT SHEPSTONE
MOUNT FRERE
BIZANA
MARGATE
PORT EDWARD

N

10 0 10 50 100 KILOMETRES

Natal Undertaking

The map shows the licensed area of supply of this Undertaking at 31 December 1977.

Sales of electricity

Total sales in this Undertaking increased by 8,2 per cent from 9 931 million kWh in 1976 to 10 747 in 1977 (8,4 per cent in 1976).

The industrial category increased its share of the Undertaking's total sales from 30,8 per cent to 32,7 per cent, registering a growth rate of 13,2 per cent (11,3 per cent in 1976). The growth in sales to mines was 14,2 per cent as against the 15,7 per cent for 1976. Domestic and street lighting showed a negative growth rate of 28,4 per cent (−0,9 per cent in 1976); as previously explained this is due to the relocation of a number of consumers in this category in the industrial category.

Development of the Undertaking

Impala substation at Richards Bay was extended, and the 275 kV supply to the Richards Bay iron and titanium smelter is practically complete. It is anticipated that the smelter will come on stream early in 1978.

A new 88/22 kV substation at Bulwer was completed during the year and supplies were made available to Bulwer, Creighton and the surrounding rural area. The new 88/6,6 kV substation for the Saiccor cellulose factory at Umkomaas has been completed to improve the security of supply to the Natal South Coast. A second 132 kV line from Illovo to Nkonka substation near Umzinto is nearing completion. In 1978 a new 88/11 kV substation is to be built at Uvongo to supplement the existing Margate 88/11 kV substation. Two additional 40 MVA transformers were installed to provide for an increased supply to Feralloys at Cato Ridge. In close proximity is the new abattoir, and at the consumers' request, the completion of the 132 kV extension and the 132/11 kV substation was deferred to 1978. Due to increased loading, a 132 kV shunt capacitor bank is to be installed at Mandini substation which supplies Sappi substation; the capacity of the latter will be increased in 1979.

For the Richards Bay-Broodsnyersplaas railway line, ten 25 kV single-phase alternating current traction supplies will fall inside the area of this Undertaking. Five will be completed by mid 1978.

By the end of 1978 an increased supply of 22 kV is to be made available at Witzieshoek for the Qwa Qwa homeland. A new 88/11 kV substation will be established in 1978 at Clarens to provide for development in this area.

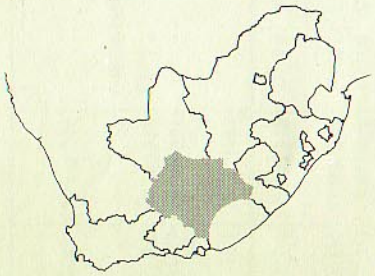
Financial

The Undertaking's financial results for 1977 are shown in the table. The average price of 1,862 4 cents per kWh sold during 1977 is 52,2 per cent higher than the figure for the preceding year (34,0 per cent in 1976). Total sales revenue for the year amounted to R200 142 579 and exceeded the corresponding figure for the preceding year by 64,7 per cent (45,1 per cent in 1976).

Consumer details			Sales of electricity						Revenue from sales in Rand		Average price in cents per kWh sold	
Category	Number		Per cent of total		kWh sold		Per cent change					
	1976	**1977**	1976	**1977**	1976	**1977**	76/75	**77/76**	1976	**1977**	1976	**1977**
Bulk supplies	37	**35**	54,19	**53,70**	5 381 512 614	**5 771 157 852**	+ 7,96	**+ 7,24**	62 026 913	**101 947 965**	1,152 6	**1,766 5**
Direct supplies:												
Domestic and street lighting	16 506	**17 131**	2,12	**1,15**	171 858 304	**123 057 191**	− 0,86	**−28,40**	3 777 680	**5 010 439**	2,198 1	**4,071 6**
Industrial	12 948	**12 403**	30,84	**32,66**	3 101 864 766	**3 510 282 293**	+11,30	**+13,17**	37 763 054	**64 094 798**	1,217 4	**1,825 9**
Mining	35	**34**	2,17	**2,29**	215 035 264	**245 561 785**	+15,65	**+14,20**	3 091 729	**5 280 044**	1,437 8	**2,150 2**
Traction	14	**15**	10,68	**10,20**	1 060 792 232	**1 096 441 367**	+ 2,50	**+ 3,36**	14 839 642	**23 809 333**	1,398 9	**2,171 5**
Total	29 540	**29 618**	100,00	**100,00**	9 931 063 180	**10 746 500 488**	+ 8,35	**+ 8,21**	121 499 018	**200 142 579**	1,223 4	**1,862 4**

	1976 R	**1977 R**	
Expenditure charged	113 309 005	**163 906 767**	
Surplus	8 190 013	**36 235 812**	**Natal Undertaking**
Deficit	—	—	
Accumulated to 31 December:			
Surplus	239 432	**36 475 244**	
Deficit	—	—	

ORANGE RIVER UNDERTAKING



AREA OF SUPPLY.....137 000 SQUARE KILOMETRES

BLOEMFONTEIN
Bophuthatswana
PERSEUS
KAFFERRIVIER
HOPETOWN
THERONSBERG
HERTZBERG G.P.O.
REDDERSBURG
EDENBURG
LUCKHOFF
PROSPECT
RIETKUIL
ORANIA
POMPIE
BERGFONTEIN G.P.O.
P.K. LE ROUX DAM
VANDERKLOOF
STRYDENBURG
ROODEKUIL S/S
TROMPSBURG
Lesotho
KRONOS
PETRUSVILLE
Orange River
SMITHFIELD
VOLSTRUISPOORT
PHILIPPOLIS
SPRINGFONTEIN
VLUGKOP G.P.O.
ZASTRON
ROUXVILLE
RENOSTERBERG
PHILIPSTOWN
BETHULIE
HILLSIDE
GOEDEMOED
Transkei
VOSBURG
BRITSTOWN
DE AAR
ORANJEKRAG
RUIGTEVALLEI
HENDRIK VERWOERD
VISTON
VENTERSTAD
HERSCHEL
MAAATHOEK
DE AAR PUMPS
HYDRA
KALKENBERG
BURGERVILLE
COLESBERG
ALIWAL NORTH
KRAMBERG F.M.
ONVERWAG
RIEBEEK
SLAGBERG
BURGHERSDORP
BARKLY EAST
HANOVER
NOUPOORT
JAMESTOWN
TEEBUS
STEYNSBURG
ELLIOT
VICTORIA WEST
RICHMOND
MOLTENO
DORDRECHT
HUTCHINSON
LOXTON
JASFONTEIN
VICTORIA CAP
MIDDELBURG
ROSMEAD
STERKSTROOM
HOFMEYR
Transkei
MURRAYSBURG
CRADOCK
GRAAFF REINET
DROËRIVIER D.S.
PEARSTON
SOMERSET EAST
POSEIDON
GRASSRIDGE

N

10 0 10 20 30 40 50 60 70 80 90 100 Kilometres

REFERENCE

AREA OF SUPPLY

TRANSMISSION LINES

TRANSMISSION LINES UNDER CONSTRUCTION

E.S.C. POWER STATIONS ◉ HENDRIK VERWOERD ◉ VANDERKLOOF

INTERNATIONAL BOUNDARIES

Orange River Undertaking

The map shows the licensed area of supply of this Undertaking at 31 December 1977.

Sales of electricity

Total sales in the Undertaking, as indicated in the accompanying table, increased by 0,3 per cent from 1 035 million kWh in 1976 to 1 037 in 1977 (13,4 per cent in 1976).

Bulk supplies continued to be by far the Undertaking's major sales category, representing 97,4 per cent of its total sales in 1977 (96,4 per cent in 1976). Although there was a reduction, compared with the previous year in sales to Port Elizabeth, this was offset by increased sales to other municipalities so that an overall growth rate of 1,3 per cent was recorded in this category. The City of Port Elizabeth alone accounted for 84 per cent of the sales in this category (90 per cent in 1976).

The negative growth rate in the industrial sales category (−28,9 per cent in 1977 and −29,3 per cent in 1976) is due to the continuing decrease in the substantial supplies required while the Orange River Project was under construction. With the project now virtually complete, the decrease in industrial sales is expected to level off.

Development of the Undertaking

At Hydra substation near De Aar 400 kV busbars were extended and in November 1977 a line bay was commissioned for the 400 kV Kronos feeder, forming the first section of the third 400 kV line from this substation to the Cape.

Additional reinforcement of the Elliot system is required and initial investigations indicate that it will be necessary to construct a 66 kV line from Melkspruit substation, near Aliwal North, to Witkrans substation near Barkly East. Reinforcement of the system between Ruigtevallei and Melkspruit is also required in the long term, and this is expected to take the form of a 132 kV line initially operated at 66 kV between Ruigtevallei and Onverwag substation.

Supply was made available to Somerset East Municipality in February 1977, following the completion of Bosberg substation with two 66/11 kV 10 MVA transformers. To ensure sufficient supply, an additional 66/22 kV 5 MVA transformer is being installed at Middelburg substation. It will be completed early in 1978. In mid 1977 another two transformers of the same capacity were installed at Onverwag substation near Burgersdorp. Early in 1978 an additional 66/22 kV 5 MVA transformer will be installed at Melkspruit substation near Aliwal North.

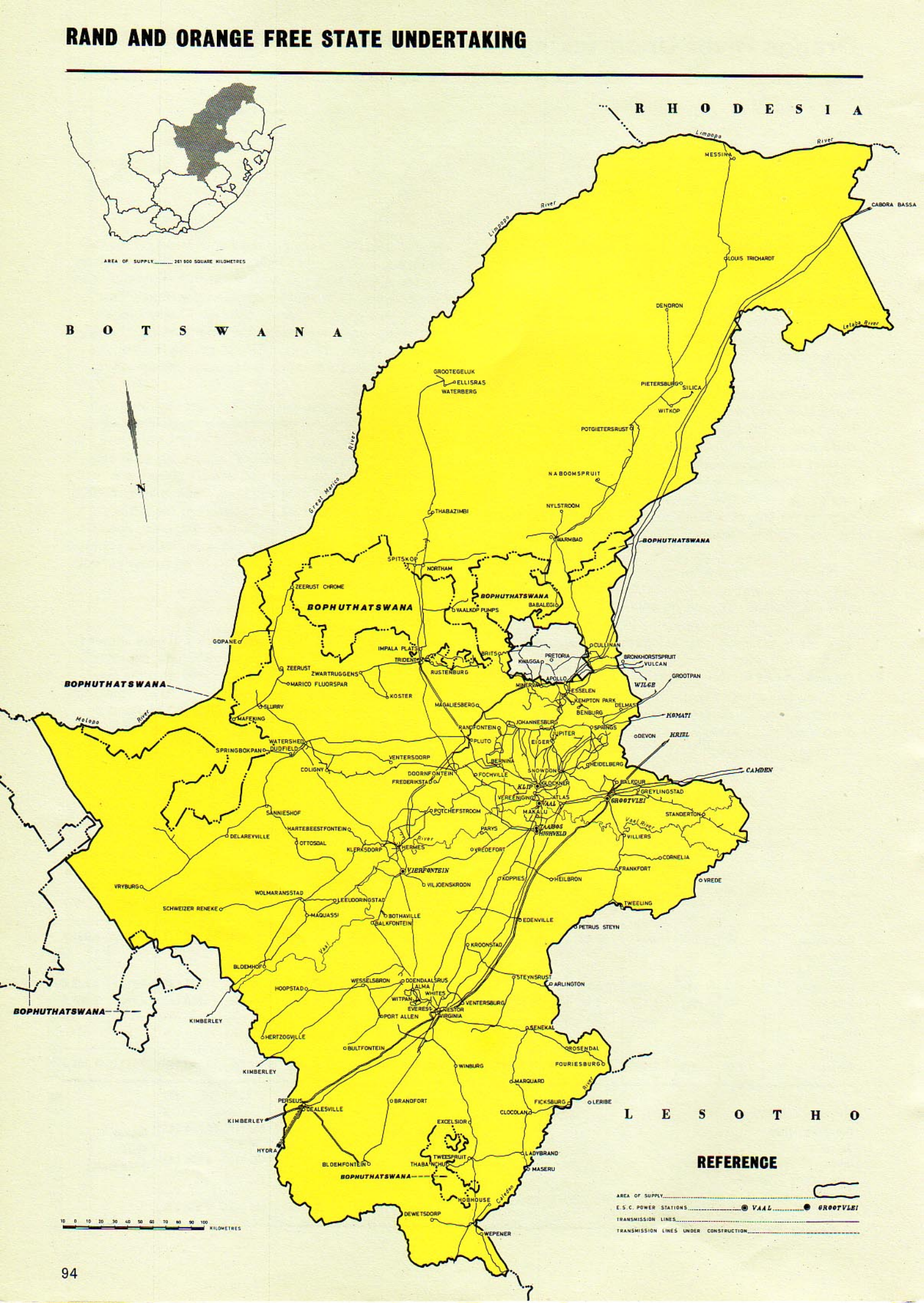
Financial

The Undertaking's financial results for 1977 are shown in the table. The average price of 1,365 2 cents per kWh sold during 1977 is 44,9 per cent higher than the figure for the preceding year (23,2 per cent in 1976). Total sales revenue for the year amounted to R14 163 196 and exceeded the corresponding figure for the preceding year by 45,3 per cent (39,3 per cent in 1976).

Consumer details			Sales of electricity						Revenue from sales in Rand		Average price in cents per kWh sold	
Category	Number		Per cent of total		kWh sold		Per cent change					
	1976	**1977**	1976	**1977**	1976	**1977**	76/75	**77/76**	1976	**1977**	1976	**1977**
Bulk supplies	37	**39**	96,41	**97,42**	997 612 534	**1 010 730 688**	+15,55	**+ 1,31**	8 832 142	**13 180 972**	0,885 3	**1,304 1**
Direct supplies:												
Domestic and street lighting	121	**113**	0,09	**0,10**	1 011 210	**1 015 659**	+16,65	**+ 0,44**	48 681	**72 197**	4,814 1	**7,108 4**
Industrial	138	**166**	3,50	**2,48**	36 185 677	**25 735 728**	−29,29	**−28,88**	867 906	**910 027**	2,398 5	**3,536 0**
Mining	—	**—**	—	**—**	—	**—**	—	**—**	—	**—**	—	**—**
Traction	—	**—**	—	**—**	—	**—**	—	**—**	—	**—**	—	**—**
Total	296	**318**	100,00	**100,00**	1 034 809 421	**1 037 482 075**	+13,04	**+ 0,26**	9 748 729	**14 163 196**	0,942 1	**1,365 2**

	1976	**1977**	
	R	**R**	
Expenditure charged	12 242 741	**17 853 343**	**Orange River Undertaking**
Surplus	16 000	**—**	
Deficit	2 494 012	**3 690 147**	
Accumulated to 31 December:			
Surplus	—	**—**	
Deficit	3 667 984	**7 358 131**	

RAND AND ORANGE FREE STATE UNDERTAKING



Rand and O.F.S. Undertaking

The map shows the licensed area of supply of this Undertaking at 31 December 1977.

Sales of electricity

Total sales for 1977 were 38 833 million kWh, an increase of 4,3 per cent (9,8 per cent in 1976) over the 37 235 million kWh sold during the previous year.

In the mining category sales increased by 6,0 per cent, which is somewhat lower than the 6,9 per cent recorded for 1976. Gold mines; which represented 83,1 per cent of the sales in this category and 36,1 (35,6 per cent in 1976) of the Undertaking's overall total sales in 1977, showed a growth rate of 5,9 per cent. This is indicative of the continued revival in this sector. In 1977 platinum accounted for 13,4 per cent of the sales in the mining category, coal for 1,0 per cent and copper for 0,3 per cent, while diamonds and other mining activities accounted for 2,2 per cent.

Good growth was achieved in the industrial sales category during 1977. This was due mainly to new supplies for Sasol and African Explosives, but is also indicative of a continuation in industrial expansion, albeit on a more modest scale than in previous years.

Development of the Undertaking

Benburg substation, north of Benoni was commissioned late in 1977; it is equipped with two 275/132 kV 250 MVA transformers and serves both Benoni and Boksburg. At Welkom the Witpan substation, with two 132/42 kV 80 MVA transformers, was commissioned to supply increased mining load in the area. Two new substations were erected for the Ergo gold recovery project: Ergo central substation was equipped with six 88/6,6 kV 10 MVA transformers, and Ergo pump substation with one 88/6,6 kV 10 MVA transformer. At Free State Geduld No. 5 Shaft a further substation, with 42/6,6 kV 20 MVA transformers, was established. A substation was also commissioned for the AE & CI Coalplex plant at Sasolburg where three 88/33 kV 80 MVA and 88/6,6 kV 20 MVA transformers were installed.

The 132 kV line re-arrangement in the Westgate area was completed. One 88 kV 48 MVAr capacitor bank was installed at Princess substation on the 88 kV side and two 24 MVAr capacitor banks at West Wits substation on the 42 kV side. Two double-circuit 88 kV lines were constructed between Princess substation and the substation of Roodepoort Municipality, while an 88 kV overhead line was built between Pretoria Portland Cement Dudfield and Watershed substation.

Financial

The Undertaking's financial results for 1977 are shown in the table. The average price of 1,339 5 cents per kWh sold during 1977 is 47,9 per cent higher than the figure for the preceding year (32,3 per cent in 1976). Total sales revenue for the year amounted to R520 166 472 and exceeded the corresponding figure for the preceding year by 54,3 per cent (45,2 per cent in 1976).

Consumer details			Sales of electricity						Revenue from sales in Rand		Average price in cents per kWh sold	
Category	Number		Per cent of total		kWh sold		Per cent change					
	1976	**1977**	1976	**1977**	1976	**1977**	76/75	**77/76**	1976	**1977**	1976	**1977**
Bulk supplies	154	**157**	25,24	**24,47**	9 399 028 127	**9 500 614 134**	+14,20	**+ 1,08**	87 099 668	**132 204 798**	0,926 7	**1,391 5**
Direct supplies:												
Domestic and street lighting	18 503	**19 328**	0,92	**1,05**	340 551 014	**408 466 969**	+15,23	**+19,94**	5 468 797	**8 282 091**	1,605 9	**2,027 6**
Industrial	23 430	**24 240**	27,68	**27,77**	10 305 907 728	**10 784 810 476**	+10,09	**+ 4,65**	98 200 784	**150 063 319**	0,952 9	**1,391 4**
Mining	102	**102**	42,80	**43,48**	15 936 509 918	**16 884 793 243**	+ 6,90	**+ 5,95**	132 251 646	**208 781 982**	0,829 9	**1,236 5**
Traction	2	**2**	3,36	**3,23**	1 253 443 993	**1 254 744 065**	+12,00	**+ 0,10**	14 165 209	**20 834 282**	1,130 1	**1,660 4**
Total	42 191	**43 829**	100,00	**100,00**	37 235 440 780	**38 833 428 887**	+ 9,79	**+ 4,29**	337 186 104	**520 166 472**	0,905 6	**1,339 5**

	1976	**1977**	
	R	**R**	
Expenditure charged	342 476 737	**528 173 417**	**Rand and O.F.S. Undertaking**
Surplus	—	—	
Deficit	5 290 633	**8 006 945**	
Accumulated to 31 December:			
Surplus	—	—	
Deficit	24 558 040	**32 564 984**	