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Brian Kantor

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# The Pricing of Electricity in South Africa: a Critical Assessment of the De Villiers Commission of Inquiry\*

#### **BRIAN KANTOR**

School of Economics, University of Cape Town, South Africa

#### **INTRODUCTION**

Almost all the electricity produced and distributed in South Africa is by the state-owned Electricity Supply Commission (ESKOM). ESKOM and its tariffs were subject to a commission of enquiry, the De Villiers Commission, which reported in 1985. The Commission was much concerned with the implications of inflation for the tariffs and the financial structure of ESKOM. Their recommendation was for what the Commission described as 'debt management-driven' tariffs. Debt management tariffs, that is, tariffs set to satisfy target debt equity ratios, are very much influenced by inflationary expectations.

This paper offers a critique of the De Villiers Commission's approach to the pricing and supply of electricity in South Africa. In the first section the Commission's views on long-run costs and its case for conserving and controlling energy pricing and production are considered. In the second section the logical implications of debt management-driven tariffs that would take account of expected inflation are examined. The third section explains how the Commission, in its attempts to allow for inflation, has confused the investment and financial decision rules. In the fourth section the attempt is made to measure the financial implications of the tariffs recommended by the Commission for consumers of electricity in South Africa. The question then arises as to what should properly be done with the cash surpluses or deficits of publicly owned corporations that result from unexpectedly high or low inflation. These issues are raised in the fifth section. In the final section the implications

\*Report of the Commission of Inquiry into the Supply of Electricity in the Republic of South Africa, RP/18/1985. Hereafter referred to as the Commission of Inquiry, with page references. of the Commission's approach for the South African economy generally are briefly considered.

It is hoped that the issues raised in this paper will be of interest not only to those concerned with utility pricing and management but also to those more generally concerned with accounting for inflation,

#### THE DE VILLIERS COMMISSION'S VIEW OF LONG-RUN MARGINAL COSTS

The De Villiers Commission of Inquiry recommended the conservation of electricity in South Africa and a much closer control over supplies of and demands for additional electricity because it did not believe it possible for South Africans to afford electricity at prices that would cover all costs. In this section the Commission's views on costs are examined. Its approach is indicated by the following recommendations:

ESCOR (ESKOM) should, in future assume a leading role in the conservation of energy and electricity while preventing prices from rising too rapidly and the generation of electricity from making excessively high capital demands on the economy. Its objective should be the maximum utilization of resources and capital in the economy through the optimum use of energy and electricity.

- Changed economic circumstances necessitate a new approach in the electricity supply industry.
- The capital demands made on the economy by the generation of electricity should be curtailed and, in order to achieve this, the objective of providing an abundant supply of electricity at cost price wherever a demand exists in South Africa should be discarded.
- The efficient use of electricity, as well as the most efficient use of generating plant, could result in a

more modest expansion programme in future (p. 16).

The recommendation of conservation and control followed consistently enough from the Commission's view that it would be undesirable to expose South Africa and particularly South African industry to the full rigours of what the Commission presumes to be 'long-run marginal cost pricing'. Instead the Commission recommends a tariff structure that it believes to be 'consumer privileged'.

Constraints on supply and demands are then justified to prevent any abuse of this privilege. The recommended tariffs and growth in supply and demand would also, it is thought, be consistent with the financial stability of ESKOM and the welfare of the economy generally. To quote the Report of the Commission:

Determining prices of products of public utilities in general and of electricity in particular is a delicate problem. The Commission of Inquiry is aware of the theoretical argument that the equilization of the electricity price with the long-term marginal costs will create optimum conditions, in so far that the consumer will then pay the actual social opportunity cost of his consumption and therefore satisfy the requirements for the efficient allocation of resources in the economy.

The Commission also knows that the traditional accounting approach to tariffs does not satisfy the requirements for the efficient allocation of resources. The traditional accounting approach is particularly adjusted to what happened in the past and does not reflect the *incremental costs of new consumption*. This creates the illusion, therefore, that the costs of current and future resources will be the same as in the past.

However, the application of marginal cost principles for the determination of electricity tariffs can create considerable problems for South Africa, especially for its exports.

The fact is that marginal cost principles are not applied, except to a degree in Britain and France, by South Africa's trading partners.

The obvious conclusion is that the marginal cost principles give a useful indication of the trends of the most important factors to be considered when determining tariffs and are very useful and important in that sense, but should not be applied as a basis for determining tariffs in South Africa. Determining tariffs in the Escom case should however be subject to the two limits of consumer 'privileging' as set out previously. Methods to achieve maximum savings with a relatively low average tariff are dealt with later (p. 202).

Most regrettably, however, the Commission reveals a complete misunderstanding of the nature of longrun marginal costs and its analysis and recommendations are fatally flawed by this misconception. The Commission wrongly regards the long-run cost of producing electricity as something more than the sum of operating costs and the costs of financing incremental capital. The Commission appears to believe it appropriate, in principle if not in practice (because it does not follow its own logic), to charge tariffs sufficient to cover working costs and finance charges, and to provide what is regarded as a safe financial margin which, in addition, is sufficient also to cover the monetary costs of capital equipment that are expected to increase with inflation.

It will be shown that the Commission has come to regard internally generated cash flows as a cost of production and that such a position is logically inconsistent. It will be indicated that while internally generated finance may or may not be an appropriate method for financing future investments, such flows should not be regarded as part of the cost of any additional investment.

The Commission has clearly failed to appreciate that the full costs of any investment will be covered if the present value of the operating profits or cash flow expected to be generated by the investment exceeds the cash that has to be laid out for that investment. If net present value, that is, present value less the purchase price of the capital asset, is positive, the investment will be worth making in the interests of the investor and of society. Equivalently, if the expected returns from any project exceed the returns required for other projects that are equivalently risky, that investment should be made.

#### PRESENT VALUE CALCULATIONS WITH AND WITHOUT REPLACEMENT COSTS

The returns required of the marginally profitable investment are regarded in the economics literature as the 'cost of capital'. It is shown below that if the expected inflation of the prices or cost of capital goods are added to other costs, the present value of any investment will be reduced or, alternatively, that for any given price of capital equipment, the internal rate of return required to achieve a non-negative net present value, will have to rise with the expected inflation rate. That is, the rate of price escalation over time necessary to justify the investment would have to be higher, and also higher than the expected rate of inflation.

In this section it will be shown precisely, by way of a formal analysis, why regarding the expected inflation of the prices of capital equipment as an additional real cost of production raises the cost of capital, as defined by economic analysis, and therefore leads to less than optimal volumes of investment.

The value of an investment may be calculated as follows. Assume a capital asset, e.g. a power station with an economic life of T years. That is, after T years the power station has no value other than that of scrap, which, for the purposes of this analysis, is assumed to be zero. The station generates operating

profits over its life; these operating profits are the differences between the money (Rand) value of the income from the station's production of electricity output and the direct Rand costs associated with this output, that is, the costs of hiring labour and buying materials which are used in conjunction with the generating plant. These revenues, costs and operating profits are expressed in money-of-the-day terms. Let us assume that operating profits,  $NOP_0$ , in the first year grow exponentially thereafter at a rate equal to the expected rate of inflation,  $\dot{p}$ . The physical output of the station, the megawatts generated, is assumed to remain constant, as is the rate of inflation  $\dot{p}$ . Therefore, operating profits at year t,  $NOP_t$ , may be expressed as follows:

$$NOP_t = NOP_0 e^{\dot{p}t} \tag{1}$$

It is also assumed that the flow of operating profits can be appropriately discounted by a constant nominal rate of interest *i*. This rate is understood to reflect the opportunity cost of investing in the plant, if abstracted from tax distortion. If so, the present value of the asset at the beginning of its life,  $PV_0$ , is calculated as

$$PV_0 = \int_0^T NOP_0 e^{jt} e^{-it} dt$$
 (2)

The equipment will be worth purchasing if this expected present value exceeds the purchase price  $(C_0)$ . Such investments would be expected to increase the wealth of shareholders or citizens if the firm were publicly owned.

Evaluating this integral Eqn (2) gives

$$PV_0 = \frac{NOP_0}{r} \left(1 - e^{-rT}\right) \tag{3}$$

where  $r=i-\dot{p}$ , i.e. where r represents the real rate of interest. Thus it may be seen that the lower real interest rates are expected to be, the more valuable the plant becomes and the more the investment is worth undertaking. Obviously, therefore, the more inflation is expected for any given level of nominal interest rates, the lower will be real interest rates and the more valuable the investment. However, such a result will not occur if replacement cost accounting principles are allowed to influence investment decisions. This may be illustrated as follows.

Assume that the money cost of the plant  $(C_0)$  is just equal to the  $PV_0$  of Eqn (3), or, in other words, investing in the equipment represents a marginally profitable investment the firm could make. Assume also that the price of new equipment is expected to rise at the same rate of inflation,  $\dot{p}$ , and that therefore the price of new equipment at time t would be

$$C_t = C_0 e^{\dot{p}t} \tag{4}$$

Hence the rate of change in the new value of plant in year t would be

$$\mathrm{d}C_t/\mathrm{d}t = C_0 \dot{p} \ \mathrm{e}^{\dot{p}t} \tag{5}$$

According to the De Villiers Commission, such

expected increases in the prices of capital equipment over time should be regarded as an *additional operating cost*. If so, the rate of profit is reduced to

$$NOP_t' = NOP_t - C_0 \dot{p} e^{\dot{p}t} \tag{6}$$

The total present value at time t=0 of the capital equipment would then become:

$$PV' = \int_0^T NOP'_t e^{-it} dt$$
 (7)

Using Eqns (1) and (6), and evaluating the integral, assuming  $C_0 = PV_0$ , then

$$PV' = PV_0(1 - \dot{p} PV_0/NOP_0)$$
 (8a)

or equivalently,

$$PV' = PV_0(1 - \dot{p}/r(1 - e^{-rT}))$$
 (8b)

In the limit as  $rT \rightarrow 0$ , disregarding second-order and higher powers in the Taylor series expansion of the exponential, this simplifies to:

$$PV' = PV_0(1 - \dot{p}T)$$
(9)

Equation (8) (or (9)) shows how the present value of a machine declines when the increase in the new price of the machine is spuriously added to costs, in the manner of Eqn (6). As an example, let the machine have a life of T=5 years, and let the real rate of interest be r=4% and the inflation rate  $\dot{p}=15\%$ . Using Eqn (8b), if the correct value of the machine is  $PV_0=1000$ , this would be reduced to PV'=320 by the replacement cost accounting method. Clearly, if investment in equipment was considered to be marginally profitable, in that its original cost was 1000, it would not be considered profitable to invest in the equipment if replacement cost accounting principles were applied.

Let us assume again that a machine is marginally profitable under conventional present value calculations.

$$C_0 = PV_0 = \frac{NOP_0}{r} (1 - e^{-rT})$$

As a first step in assessing tariff distortions we now determine what new initial rate of profit NOP<sub>A</sub> would be necessary to maintain marginal profitability when costs are inflated by the replacement cost method.

From Eqn (5) the present value of the flows generated by the replacement cost method is:

$$\int_{0}^{T} C_{0} \dot{p} e^{\dot{p}t} e^{-it} = \frac{C_{0} p}{r} (1 - e^{-rT}) dt \qquad (10)$$

Adding the initial cost,  $C_0$ , the total present value of costs C' is

$$C' = C_0 [1 + (\dot{p}/r)(1 - e^{-rT})]$$
(11)

If  $NOP_A$  are the operating profits required in the first year to just cover inflated costs, C', that is to yield zero net present value under replacement cost accounting conventions, then

$$C' = \frac{NOP_{\mathbf{A}}}{r} \left(1 - \mathbf{e}^{-rT}\right) \tag{12}$$

and from Eqns (12) and (10),

$$NOP_{\rm A}/NOP_{\rm 0} = C'/C_{\rm 0} \tag{13}$$

Then, using Eqn (11), NOP. /NO

$$NOP_{\rm A}/NOP_{\rm 0} = 1 + \dot{p}/r \ (1 - e^{-rT})$$
 (14)

It can be seen that the higher the rate of expected inflation, the lower the real interest rate and the longer the economic life of the asset, the greater will be the ratio  $NOP_A/NOP_0$ .

Tables 1 and 2 indicate the influence of inflation, economic life and real interest rates on this profit ratio. These ratios can be converted into rates of escalation of prices by making assumptions about the relationship between revenues and direct costs. Net operating profits before finance charges NOP is the difference between revenues R and direct costs D. Thus

$$NOP = R - D \tag{15}$$

and so

$$NOP_{\rm A}/NOP_{\rm 0} = (R_{\rm A} - D)/(R_{\rm 0} - D)$$
 (16)

Hence

$$\frac{R_{A}}{R_{0}} = \frac{NOP_{A}}{NOP_{0}} - \frac{D}{R_{0}} \left(\frac{NOP_{A}}{NOP_{0}} - 1\right)$$
(17)

If revenue was, say, double direct costs, i.e.  $R_0 = 2D$ , and if it is assumed that  $NOP_A/NOP_0 = 3.47$ , that is, when real interest rates (r) = 2%, inflation = 15% and economic life of the equipment (T) 20 years (see Table 1), then

$$\frac{R_{\rm A}}{R_{\rm 0}} = 3.47 - 1/2 \ (3.47 - 1) \tag{18}$$
$$= 2.24$$

Thus tariffs would have to be as much as 224% higher each period to cover costs when these are regarded as including replacement cost of capital. It was such tariffs that the De Villiers Commission implicitly regarded as being unacceptably high.

Present value calculations would normally be com-

Γable 1. NOP <sub>A</sub> /NOP <sub>0</sub> :15%   inflation				
Real interest	Eco	nomic life (ye	ears)	
rates (%)	20	10	5	
2	3.47	2.36	1.71	
4	3.07	2.24	1.68	
6	2.75	2.13	1.65	

Table 2.	NOP <sub>A</sub> /NOP <sub>0</sub> :5%	
	inflation	

Real interest	Economic life (years)		
rates (%)	20	10	5
2	1.82	1.45	1.24
4	1.69	1.41	1.23
6	1.58	1.38	1.22

plicated by taxation in the form of corporate tax and interest and depreciation allowances. Taxation influences the required after-tax returns and the cash flows generated by an investment, the so-called effective rate of taxation, and thus the cost of capital.

The effective rate of taxation is defined as the ratio of taxes paid to economic income. Economic income is defined as the flow of real consumption power generated over a period which is equivalent to real or inflation-adjusted income, plus real capital gains or losses, including real or economic depreciation. ESKOM has not paid taxes and the De Villiers Commission does not recommend that it should be made liable for them. Thus a concern for depreciation allowances as a tax shield is not relevant in this case. Also, the tax shields nominally provided by fixed interest debt are not applicable. Given taxation, debt finance is likely to be preferred to equity finance because interest payments, unlike dividend payments to shareholders, are treated as a business expense and therefore reduce the actual taxes paid by the firm. In ESKOM's case therefore the cost of equity is the same as debt. (For a full account of the influence of taxation on costs of capital, see Auerbach, 1983.)

## THE INVESTMENT AND THE FINANCING DECISIONS

#### **Avoiding Confusion Created by Inflation**

It will be explained below that by introducing debt management objections for ESKOM the Commission of Enquiry has confused the investment decision and decisions about how investment is best financed. This confusion, it is suggested, arises from a false application of inflation-adjusted or replacement cost accounting.

A number of points about simple present value, or discounted cash flow analysis, should perhaps be emphasized. First, the analysis allows for the fact that the asset has a limited economic life. The asset is expected to generate positive cash flows, that is, revenues in excess of operating costs, for a limited number of years. Other things being equal, the shorter the expected economic life, the lower the present value and the higher the internal rate of return required of the asset to generate a present value that exceeds the purchase price of the investment.

The present value calculations can be made consistently in money-of-the-day terms. It is the purchase price of the asset in today's money that has to be compared with the present value of the cash flows, also expressed in today's money. Expected inflation can be taken account of in the estimates made of revenues and costs for each period over the expected life of the asset. More important, too, is that expected inflation is also reflected in the interest rates charged for finance, or in the calculation of the inflation-adjusted returns that could be generated by other competing projects. The higher the expected inflation rate, the higher (other things being equal) will be the nominal interest cost of finance or the required nominal returns.

As indicated, real rates of interest are critical for the establishment of present values. The relationship between inflation and real interest rates is not, however, an obvious one (see Fama, 1976).

Inflation itself will not influence the economic costs of, or benefits from, an investment unless real interest rates or the real price of capital are expected to change, that is, unless the price of the capital goods in question is expected to rise faster or slower than the prices of consumer goods in general. Thus, in the absence of such real effects, higher or lower than expected inflation will not affect the success of any investment project undertaken at a point in time. What is gained or lost in the form of higher or lower cash flows generated by the project will be lost or gained by way of higher or lower financing charges or required returns that are used to discount such flows. The investments of scarce resources that are worth financing with lower inflation are also worth financing if inflation is expected to be much higher, providing relative prices or real interest rates and taxes do not change to the disadvantage of the particular project. It is the commitment of the real resources to a particular project that represents the costs to society. These resources could have been used for another purpose. However, with more inflation, more nominal finance and more debt or equity will be required to finance any given real volume of investment in the future. That is, the nominal amount of finance required will have to increase.

The De Villiers Commissioners have misinterpreted the notion of costs because they have confused the investment decision with the financing one. One of the axioms of modern financial economics is the necessity to separate these decisions. The pioneering contribution to this field of analysis was made by Modigliani and Miller (1958). For a more recent interpretation of the issue, see Brealey and Myers (1981), especially Chapters 17 and 18. The De Villiers Commissioners appear, however, to have fallen into a trap left for them by so-called replacement cost accounting principles. If prices are to be regulated, then replacement costs, as opposed to historical costs, assuming that the capital equipment deserves to be replaced, would need to be recognized as constituting part of the relevant costs of production in the determination of current tariffs. (This point is taken up again below.) Nevertheless, regarding additional expected increases in the prices of capital equipment as constituting an additional component of the cost of any planned investment is logically inconsistent. As indicated, the effects of expected inflation on the costs of capital can be fully reflected in the standard present value calculation. The savings the firm may plan to make by retaining part of the cash flow generated by an investment should not be regarded as a cost of investment but as a financial decision.

The application of inflation-adjusted accounting principles can be useful for industries subject to price

control. Adjusting for the inflated costs of capital equipment is also useful in justifying higher prices, not only to the price controller but also to public opinion. High profits, when measured in historical accounting terms, might be regarded by the public as a justification for lower prices. If tariffs are not fully adjusted for the inflated prices of capital goods, consumers might be receiving electricity at less than its full resource or opportunity costs and would be encouraged to demand more electricity than would be socially desirable. Such demands would then have to be satisfied with additional real investment.

Non-regulated firms automatically price their goods and services at what their managers think their markets will most profitably bear. What the market will bear, if it is a growth market subject to competition, will be closely related to the full costs of production, including the value of the physical capital used by the firm and its rivals, expressed in money-of-the-day prices.

Thus the disagreement with the De Villiers Commission of Inquiry is not about the desirability of adjusting prices for actual inflation and for the inflation of the prices of equipment, it is about what should be regarded as full incremental, inflation-adjusted costs of production. If prices were set, as indicated, by adaptations of Eqns (2) or (3) which were updated regularly, consumers of electricity would not be subsidized. However, if prices were set to cover not only the actual inflation of equipment prices but also set in advance to cover expected further increases in the price of capital equipment consumers would be overcharged, as has been indicated above. Such overcharging would not be possible in a competitive environment.

There is, moreover, contrary to the Commission's view, no economic justification for preferring internal to external finance as the means for financing investment decisions that are economically justifiable. The critical economic issue is whether or not, calculated in present value terms, an investment is worth making. The question of how best to finance the investment is secondary, as modern financial economics has explained (see Brealey and Myers, 1981). Additional finance could be in the form of additional issues of debt or equities or internal finance. Internal finance may be convenient and may save the investing firm some of the transaction costs of raising additional equity or debt finance. Relying on internal finance represents a decision about the use of savings or income generated from past investment decisions. Retaining cash is an alternative to paying it out, and in fact is only justified when a firm believes itself capable of earning superior returns for its shareholders. Usually, tax considerations, especially the fact that capital gains are taxed at lower rates than 'income', are crucial in the decision firms make to retain cash on behalf of shareholders rather than to pay it out as dividends and borrow more. As the De Villiers Commission indicates, relying on a greater proportion of internal finance would reduce the ratio of debt to equity finance capital. This ratio may then imply less risk for shareholders or lenders. Nevertheless, the risks of providing external finance, be it in the form of debt or equity, to any particular borrower will be fully reflected in the returns required by suppliers of capital. These returns are indicated in required interest rates or dividend yields.

The De Villiers Commission completely misplaces the emphasis. Its recommendations for ESKOM tariffs are, in its own words, 'debt management driven' (p. 199). Thus, in its recommendations, financial management is given precedence over sound economic principles. Yet the Commission believes that its recommended prices are 'consumer privileged'. In fact, ESKOM, by the end of 1983, according to calculations made for the Commission (see Table 70, p. 193), had already accumulated R12000 million or so of equity finance out of internally generated cash. The benefits of greater equity on risk have no doubt been reflected in ESKOM's costs of finance.

#### TARIFFS AND INTERNAL SAVINGS

In this section the financial implications, and especially the internal savings implied by the Commission's recommended tariffs, are revealed. The Commission's financial analyses were fully developed in pages 196–200 of its Report, and especially in Tables 74 and 75.

The Commission considered the alternative financial implications of 7% and 5% growth in final demand, given two different assumptions about the inflation of working costs, 10% and 15%, respectively. Captial costs were assumed to rise at 11.7% per annum. The rate of interest used in the calculations was 14% per annum. From information given in Tables 74 and 75 the growth in debt and in the nominal equity value of ESKOM and the present value of this equity in 1983, assuming 14% per annum interest, have been calculated by the author and reported below. The growth in the value of equity is derived by subtracting the increase in capital expenditure each year from the increase in debt. The growth in this equity is derived from internal financial sources, that is, from savings of cash, as indicated in Tables 3 and 4. Over a 20-year period of faster growth and given the other assumptions, including a discount rate of 14% per annum, the recommended tariffs would have produced additional equity with a 1983 present value of R4943 million. Slower growth would have generated equity worth R3276 million in 1983.

As may be seen, the faster-growth scenario implies more debt and more equity for similar tariffs. However, faster growth implies more debt and a higher ratio of debt to equity, and was therefore rejected by the Commission (see p. 199).

As indicated, the Commission's advice, counterintuitively, is for tariffs that imply rather lower than higher savings and therefore the creation of less rather than more equity, in the interests of incurring less

Table 3. High-growth Assumption <sup>a</sup>				
(Load growth 7% p.a.)—Interest rate 14% p.a.				
	(1)			
	Growth in	(2)		
	equity	Present value		Tariff level
Year	(R million)	in 1983 of (1)	Growth in debt	(cents per unit)
1983				3.36
1984	129	114	2 762	3.75
1985	211	163	2830	4.22
1986	316	214	3210	4.72
1987	409	243	3 4 2 4	5.22
1988	586	305	3 455	5.69
1989	629	292	3 760	6.17
1990	659	264	3 757	6.64
1991	695	244	4027	7.13
1992	774	238	4 987	7.70
1993	913	347	6493	8.38
1994	1 070	254	8026	9.17
1995	1 215	252	9195	10.02
1996	1 374	250	10411	10.92
1997	1 609	257	12292	11.93
1998	1 846	258	14007	13.02
1999	2019	248	14801	14.14
2000	2 324	256	17827	15.40
2001	2887	269	22 298	16.85
2002	3 459	287	26743	18.48
2003	3965	288	29 796	20.21

<sup>a</sup>Under the assumption of 10% per annum inflation of working costs and 11.76% per annum inflation of capital costs.

These tariffs grow at an annual average compound rate of 9.39% per annum.

Source: Table 74, p. 199.

(Loa	ia growin 5%	% p.a.)—in	terest rate	14% <b>p.a.</b>
	(1)	(2)		
	Growth in equity	Present value	Growth in	Tariff level
Year	(R million)	of (1) in 1983	debts	(cents per unit)
1984	129	113	2762	3.78
1985	210	162	2818	4.31
1986	313	212	3187	4.86
1987	401	238	3 3 2 7	5.40
1988	558	290	3164	5.91
1989	578	264	3164	6.41
1990	571	261	2 993	6.88
1991	586	235	3 2 2 4	7.39
1992	600	240	3612	7.94
1993	567	153	3 505	8.49
1994	499	118	3175	9.03
1995	450	94	3 302	9.61
1996	478	87	4 4 8 4	10.31
1997	542	87	5868	11.16
1998	655	92	7 7 3 9	12.16
1999	921	110	10860	13.41
2000	1 059	100	12657	14.79
2001	1117	105	13166	16.22
2002	1 283	106	15 208	17.79
2003	1 446	105	17185	19.50

# Table 4.Slower-growth Assumption(Load growth 5% p.a.)—Interest rate 14% p.a

Source: Table 75, p. 200.

debt. Nevertheless, consumers will be paying more, not less, than it would cost to produce electricity under both sets of 'assumptions' made by the Commission. Thus neither scenario, in fact, represents a policy of 'consumer privilege'. Consumers would, in fact, be overpaying and be getting less electricity than they might prefer, given a 7% growth assumption, and still less, given 5% growth.

The obvious economic exercise to have been applied by the Commission to the determination of tariffs would have been to establish the relationship between the price of and the demand for electricity, i.e. a demand schedule for electricity, after making assumptions about, influences other than price on demand. What would also have been required is an estimate of the costs of production at different levels of output, that is, an estimate of the supply function for electricity generation. If costs were defined to include the full costs of producing electricity, including the cost of capital (defined in opportunity cost terms) as the rate of return realizing zero net present value from incremental investments, as in Eqns (2) or (3), then the recommendation consistent with efficient use of resources would have been for a price for electricity that simply equalized expected demand and expected supply at a price that covered costs. Furthermore, the larger the levels of real demands expected to be worth supplying, the better.

Improving the ratio of equity to debt might be regarded as appropriate for encouraging supplies of finance. However, such additional attractions for lenders would surely be intended to reveal themselves in lower costs of debt finance. That is, a lower debt ratio could mean lower costs of finance, and for a publicly owned monopoly this surely would imply lower tariffs. Such possibilities are not reflected in the Commission of Enquiry's calculations. Less debt is regarded as desirable, not for the sake of ESKOM but for the sake of South Africa, yet the Commission regards such recommendations as consistent with economic criteria. Clearly, they are not. Any reduced access to foreign loans and increased domestic borrowing may mean higher real costs of borrowing and costs of capital. Such higher costs may, in turn, mean less demand for and supply of electricity. Access to internal finance, however, does not make the cost of capital any lower, and there is no basis in economic science for choosing one or other internal financing ratio.

#### APPLYING THE CASH SURPLUSES OF PUBLIC CORPORATIONS

The issue of how best to manage the unexpected cash surpluses or deficits of public corporations is raised below. The alternatives considered for cash surpluses are whether the cash should be best used to finance the corporation's investment expenditure or public expenditure generally.

If public policy limits freedom of entry or exit then the pricing decisions of the publicly or privately owned corporations protected from competition become, as a matter of logical consistency, an issue of public policy. Moreover, the criteria for such pricing decisions are unlikely to be economic ones. If the objective were economic efficiency, then competitive forces would surely not be denied in the first instance. However, if the prices of publicly owned corporations with monopoly powers were to be established according to economic principles, in the absence of competition, then prices should, as indicated, be set to cover expected full costs, including the return required by lenders for supplying finance.

As suggested previously, the obvious method to apply, if in fact economic or full-cost pricing is to be the accepted principle, would be to set tariffs consistently with Eqns (1-3). If inflation increased unexpectedly and prices were raised in line with Eqns (1-3) for increments to the capital stock, then public corporations applying such pricing formulae would be generating cash surpluses, after actual financial costs were paid.

The question then arises as to what should be done with such cash surpluses. It does not follow at all that the cash should necessarily be used to reduce the real debt of the public corporation. It could instead be transferred as a dividend to government and applied to reduce government debt or taxes. In this way the real debt ratio of the corporation would remain unchanged, while the taxpayer in general enjoyed the benefits of unexpected windfalls earned for them by the managers of publicly owned corporations. Similarly, if inflation turned out to be unexpectedly low and if prices were set according to the costs of incremental capital, a large fixed-interest borrower might incur cash deficits. If so, the government, acting for the taxpayer, might then be called upon to contribute more equity capital to the corporation in order, in different circumstances, to maintain the ratio of its real debt to real equity. In this way the financial stability of a public corporation would be assured and its risks of default would be no greater or less than that of the government itself.

If the case for public ownership of the Electricity Supply Commission is accepted, then a logical implication of this is that ESKOM should not behave like a private company and that therefore the tariff should not be 'debt management driven'. A publicly owned corporation seeking economically efficient solutions could surely use its public status to minimize its costs of funds. The government supervising business activities undertaken directly by its agencies would then, in turn, wish to ensure that it was getting good value for its taxpayers' money or potential money. A debt management-driven tariff for a publicly owned corporation is in fact a *non-sequitur*.

It should be emphasized that setting prices that would cover the full costs of capital is only justified if, in fact, additions to or replacement of the capital stock are economically justified. If the market for the output of the publicly owned corporation were expected to decline at prices that would have to be charged to cover the full costs of replacing capital, then, following economic principles, the capital stock should not, in fact, be replaced. In such circumstances the particular capital stock should be allowed to shrink to yield efficient use of resources. Again, following economic principles, such physical capital would not be scrapped unless, when using such capital, the direct labour and material costs associated with the use of the capital would not be covered. In other words, the economic principle to apply is that the replacement of a particular capital asset is only justified if the required return on the additional capital utilized for the purpose can be expected to be recovered through prices. However, capital assets should be kept in production providing direct costs are covered. In such circumstances, charging what the traffic will bear, providing it does not exceed full costs, would seem to be the appropriate pricing policy. It is quite possible, given a rapid and unexpected increase in inflation, that a large fixed-interest borrower could earn cash surpluses over financial charges even while its real volume of activity, on economic principles, should decline. These surpluses could be used to retire public sector debt.

In a declining industry the market value of physical capital will be dependent on the prices realized for the goods and services produced. In such circumstances the cost of capital cannot be determined independently of the prices of goods produced. Similarly, if prices determined on a replacement cost basis, according to Eqns (2) and (3), would result in declining levels of demand and outputs, replacement of capital would not be justified and the prices of new equipment then become irrelevant.

The accuracy with which demand is forecast will determine the success or otherwise of the investment decisions undertaken by any firm, be it publicly or privately owned. A concern for the accuracy of ESKOM's forecasts of electricity demand is therefore of relevance for any recommended tariff, be they debt management driven or determined according to economic principles, properly understood.

A further common concern would be the quality of the actual investments made in additional capacity, that is, the efficiency of the investment, in engineering terms. The Commission has evaluated ESKOM's management in terms of their ability to forecast demand and costs and generally found its management wanting (see Evaluation of Past Performance, pp. 121–87). Such considerations are not the subject of this analysis, and no evaluation of either the Commission's position or ESKOM's performance in these respects is attempted.

The De Villiers Commission has directed its attention to the perceived dangers of higher inflation and the higher costs of replacing capital for the financial stability of ESKOM. In fact, assuming that ESKOM enjoys the right to increase its tariffs in line with inflation, its financial stability might be threatened if inflation should prove unexpectedly low rather than unexpectedly high. Low inflation will mean low interest rates, and since ESKOM is committed to paying what may prove to be high interest rates, low inflation would mean an increase in ESKOM's real debt liabilities. It is to cope with such possibilities, the possibility of much lower rather than higher inflation, that the reduction in financial risks provided by equity finance might be desirable. The Commission, in fact, gets it completely the wrong way round. It seeks to protect ESKOM against higher rather than lower inflation and higher rather than lower interest rates.

There are political risks attached to regulated in-

dustries in inflationary periods, particularly the risk that the industry will not be allowed to raise prices. South African public corporations, including ESKOM, clearly have not lacked for freedom to raise prices and have certainly not suffered any financial difficulties for reasons of inflation. Indeed, the opposite is true. The South African public corporations and especially ESKOM, as is well documented by the Commission, have enjoyed huge financial advantages, the result of unexpectedly high inflation combined with the freedom to price to what their markets would bear.

#### SOUTH AFRICA AS AN ENERGY PRODUCER

#### **Exploiting Comparative Advantages**

It has been argued that there is no economic justification for artificially restricting the supply of any good or service at prices that cover costs when costs are properly defined. Indeed, to restrict the supply of electricity in South Africa and to charge more than it would cost to produce could represent a tragic waste of resources. As is argued in this section, it would, and has to date, represented a failure to exploit the comparative advantage South Africa has in conveniently located coal reserves, with a low market value, net of transport costs to world markets. Locating power stations on top of coalfields saves the cost of transporting coal to market, which, following economic principles, should be passed on to South African consumers of electricity from coal. The Commission therefore is fundamentally wrong to compare South Africa with the advanced industralized countries who have been forced to adapt to high energy costs. Energy costs in South Africa could be relatively low (lower than the Commission understands them to be) and still cover their costs of production. South Africa is an energy producer and consumer, and relatively low energy costs should surely form one of the foundations of its economic development process. It is this comparative advantage that has been denied in recent years by ESKOM's pricing policies, and would continue to be denied if the Commission of Inquiry has its way. It seems to the author that in the 1970s and early 1980s ESKOM priced its electricity according to its judgement of what its market would bear. The markets could bear more heavily, because the cost of electricity generated from oil had risen so dramatically and competition from coal-fired electricity generating plants was inhibited. The Commission's position on these issues in indicated as follows:

When one takes into account the whole of the circumstances in the South African economy, the investment patterns, the inefficiency of application of capital and labour, and the complete change precipitated in the world economy by the energy crisis, the key question is whether South Africa has not now also reached a post-oil crisis long-term growth phase marked by a low economic growth rate of between 2.5% and 3.5% per annum, after exclusion of the cyclical fluctuations. This is the conclusion reached by the Commission of Inquiry (p. 8).

The De Villiers Commission also, like the Franszen Commission before it, gives no consideration to the effects that savings of public corporations have on savings generally. Taxes and the charges of the public corporations in South Africa affect real disposable incomes and savings made from them, and there can be no presumption that what is saved by ESKOM and other public corporations does not lead to greater consumption and less saving elsewhere in the economy (see Franszen Commission, 1970, especially paragraphs 190–97).

#### CONCLUSION

The Commission has opted for policies and tariffs that, in principle, would be highly inappropriate, that is, to protect and subsidize consumers, but which in practice would continue to penalize consumers of electricity. Accepting the recommendations of the Commission would give South Africans the worst of both worlds—bad principles and bad practice. The Commission has collected information of great value, and it has provided this information in an admirably clear way, accessible also to its critics. This information can be put to better use so that the assets of ESCOM can be used to much better effect in the interests of the consumers of electricity and the South African economy in general.

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