1. INTRODUCTION

This Study originated as a result of a request by PricewaterhouseCoopers, on behalf of the Botswana Power Corporation (BPC), to consider the investigation into the pricing policy of South Africa's electricity utility company, which provides electric power to BPC. In particular, the request alluded to the need to determine whether the current annual price revision was based on sound economic principles.

GOPA Group Southern Africa is an independent private company, registered in South Africa, with a 60% shareholding by two German development consulting firms (GOPA Worldwide Consultants and EPOS Health Consultants). This Study has been assigned to GOPA Group SA's Joint Managing Director, Dr Roelof Botha, who holds a Doctorate in Economics, a Bachelor's degree in Accounting, and who possesses 30 years of relevant experience. He has been assisted by Azwidohwi Munaka, who is an associate of the firm. Mr Munaka holds an Honours degree in Economics.

2. RATIONALE FOR THE STUDY

The rationale for conducting this Study is related to the annual price escalation for power supplied to BPC by Eskom. Currently, the policy is understood to entail an increase based on the prevailing annualised rate of increase in the South African Production Price Index (PPI) in October of the previous year.

It is questionable whether this policy is the most appropriate, particularly as a result of the volatility of the PPI over the past two years, and the fact that the PPI entails a wide range of commodities that are not remotely associated with the cost of electricity generation.

3. INTERPRETATION OF TERMS OF REFERENCE (TOR)

Following correspondence between PricewaterhouseCoopers (both the Johannesborg and Gaborone Offices, the TOR for this Study has been interpreted to entail the following three key issues:

- The link between the Consumer Price Index (CPI) and PPI
- The components of CPI and PPI
- Relevance of PPI to electricity generation

The Study will address these issues, and will also offer some reflections on the likely future scenario for CPI and PPI trends, as well as recommendations on a pricing policy that would best suit BPC's requirements.

4. METHODOLOGY

In addressing the TOR and also venturing into the sphere of policy recommendations, it was decided to adopt a methodology consisting of the following steps:

- ***Step 1:*** *Determination of the link between the CPI and the PPI*

  This step will entail a statistical overview of CPI and PPI trends, in order to establish the extent of causalities between these two price indicators. The existence of time lags in any relationship between CPI and PPI will also be determined. Care will be taken to review the latest available official data, which relates to the twelve-month period ended July 2003. Historical data will also be used.

- ***Step 2:*** *Overview of the composition of CPI and PPI*

  The second step will be to provide an overview of the way in which both the CPI and the PPI are composed, with reference to the weighting of the major items and/or commodities included in the two indices. This step will also identify the components that are relevant to the electricity sector. Both the composition and the weighting of the baskets of goods and services (CPI) and commodities (PPI) are updated regularly by Statistics South Africa (SSA) and the latest available data will be utilised.

- ***Step 3:*** *Analysis of the cost composition of electricity generation, transmission and distribution in South Africa*

  This step is required in order to assist in the assessment of the feasibility of any particular price indicator to be utilised for electricity price escalations. It also provides the basis for the comparison between electricity price trends and general price indices, which follows in the next step. The research team will investigate the complete value chain for the electricity sector and has also interviewed authoritative experts in the industry.

- ***Step 4:*** *Assessment of likely future price trends – electricity, CPI and PPI*

  This step will provide an indication of the deviation between electricity price increases in South Africa and trends in the CPI and the PPI . This exercise is necessary as an introductory measure, in order to adequately address the third component of the TOR, namely the relevance of the PPI as the basis for BPC's electricity price escalation.

  Step four will also provide an extrapolation of an envisaged future scenario for the CPI, the PPI and electricity prices in South Africa. Such an exercise is necessary in order to arrive at a conclusion regarding the preferred basis for negotiating future tariff increases by Eskom.

These forecasts will be provided on a relatively short-term basis (for the next two years), as well as an indicative view for the longer term (five to ten years). The assumptions that are necessary to conduct such an exercise will be based on a combination of lessons learned from historical trends; the consensus forecast of 30 of South Africa's leading economists (as published by the daily newspaper *Sake-Beeld)*; and the current capital investment plans of Eskom.

- ***Step 5:*** *Conclusion and recommendations*

5. RESEARCH RESULTS

5.1 The link between the CPI and the PPI

The measurement of inflation has become an important instrument in international commerce and industry, mainly because of its usefulness in determining the basis for the periodical adjustment of prices.

In order to measure inflation, a method is required that summarises price trends of all goods and services and that expresses these trends as an average, based on a weighting of the different individual price trends.

Two of the most widely used price indices are the consumer price index (CPI) and the production price index (PPI). In order to assess the relevance of using either one of these two indices, the following concise definitions are provided:

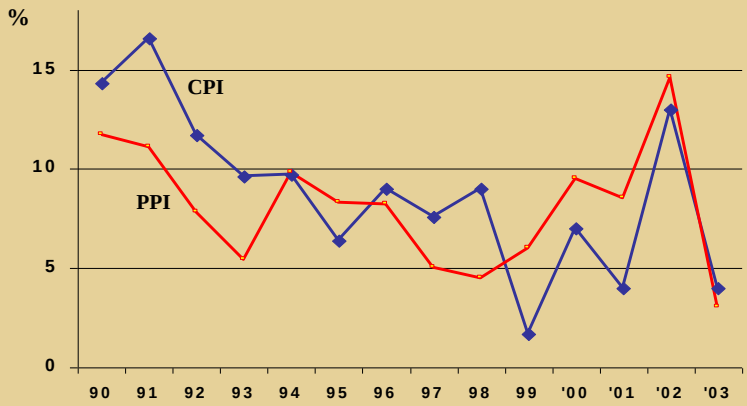
- The CPI measures the cost of buying a pre-determined basket of goods and services, representative of an average consumer. The weighting of the different goods and services is adjusted from time to time to reflect changes in consumption demand patterns.

- The PPI indicates the changes in production prices of locally produced commodities. It is compiled in terms of a weighting of the sectoral composition of aggregate production in the country and covers the following sectors: agriculture, fishing, forestry, mining & quarrying, manufacturing, electricity, gas & steam, and water. One of the advantages of using the PPI as an indicator of price trends is the fact that it measures prices at the level of the first commercial transaction, i.e. before consumption expenditure occurs. A disadvantage is the fact that sectoral price trends are, as a rule, significantly more volatile than the components of the CPI basket.

The empirical link between the CPI and the PPI can be determined through a straight-forward statistical analysis. It is important to distinguish between the short term and the long term when attempting to establish causalities between two different indicators.

Figure 1 illustrates the link between the CPI and the PPI over the past twelve years, whilst figure 2 illustrates the relationship between these two indicators over the past 15 months.

Figure 1: CPI and PPI (annualised as at October of each year)



Note: 2003 = Forecast

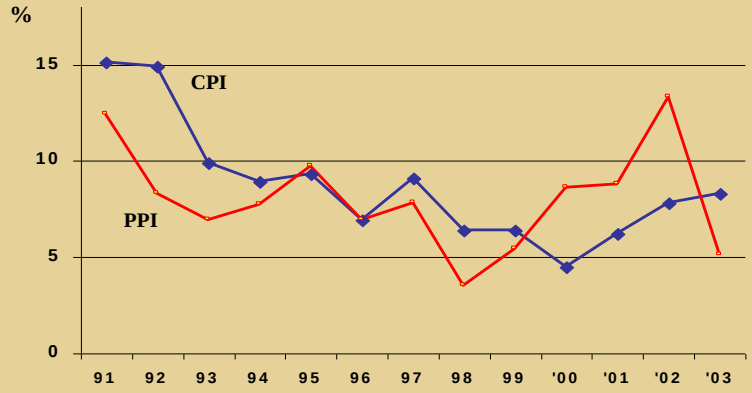
It is clear from figure 1 that a fairly close historical correlation is to be found between the PPI and the CPI. Conventional economic wisdom suggests that an index of production prices usually tends to act as a leading indicator for consumer prices.

The underlying logic of this lagged causality relates to the aggregate supply chain in the economy, which takes some time before being translated into effective demand, although the time lags can differ substantially between different industries. This correlation is clearly evident from the data contained in figure 1.

Figure 2 contains the same comparison between CPI and PPI price trends, from 1991 onwards, but differs from figure 1 with respect to the method of determining the percentage increase in the index. In figure 1, the index value in October of each year was compared to the value twelve months earlier.

In figure 2, the average monthly increase in the CPI (on an annualised basis) for the twelve-month period ended October of each year (since 1991) has been compared to the PPI (on the same basis). It is clear from this comparison that a marginally less volatile pattern emerges from the latter technique.

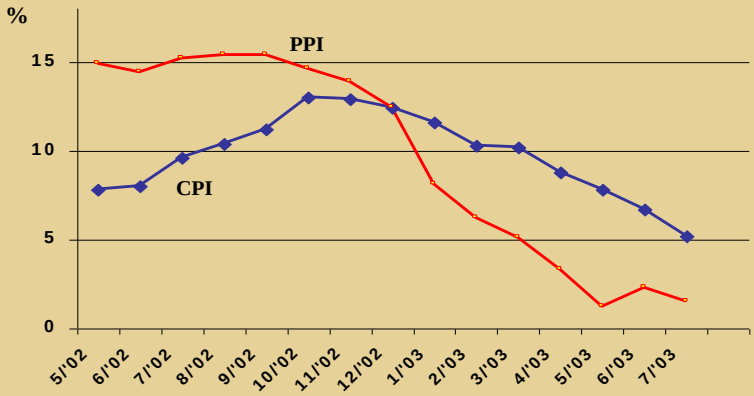
Figure 2: CPI and PPI (12-month average as at October of each year)



Note: 2003 = Forecast

Figure 3 illustrates the short-term trends in South Africa's CPI and PPI. This clearly confirms the existence of a lagged positive correlation between the PPI and the CPI, also in the short term. It also confirms a trend depicted by figures 1 and 2, namely that production prices are inclined to perform in a more volatile manner than consumer prices.

Figure 3: CPI and PPI trends over 15 months



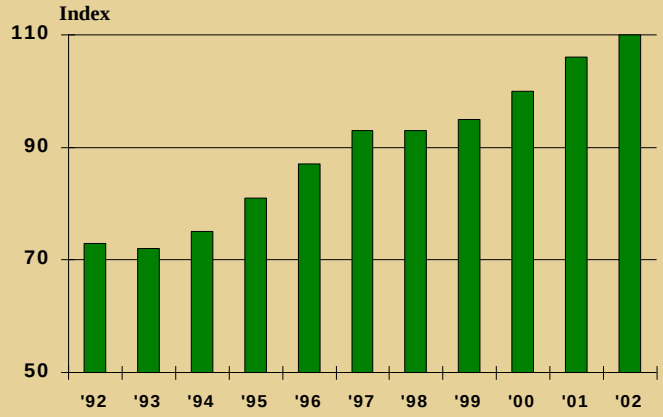
Note: 2003 = Forecast

In analysing price indicators, it is necessary to point out the reasons for any noticeable changes trend lines. The long-term price trend of both the PPI and the CPI has lowered significantly, particularly after South Africa's transition to a democracy in 1994.

Major reasons for this trend are:

- A return to positive real economic growth, which has allowed the benefits of economies of scale to become manifested in a slowing-down of price increases.
- Trade reform, which has witnessed a significant reduction in import duties. These benefits have been passed on to consumers in the form of lower imported prices, both directly and indirectly (through lower imported input prices in many industries).
- A return to fiscal stability. South Africa's budget deficit/GDP ratio in fiscal 2002/2003 amounted to 1.1%, compared to a ratio of above 9% in fiscal 1992/93. Since 1994, the South African Government has contained its expenditure levels to such an extent that no demand-side inflation was imposed on the economy from the public sector domain.
- A return to normalised international trading relations, which has obviated the need to incur costs associated with the combating of the effect of financial and trade sanctions.
- Productivity improvements, which have made it possible to accommodate relatively high wage demands without a return to double-digit inflation (see figure 4).

Figure 4: Labour productivity growth in SA (2000 = 100)



In the beginning of 2000, both consumer inflation and producer inflation were at their lowest levels in almost 30 years. Following a period of consistent reductions in the levels of both consumer inflation and producer inflation, double-digit inflation was, however, recorded again in 2002 for the first time in a decade.

Fortunately, the reasons for the increase in inflationary pressure during 2002 amounted to a so-called "inflationary spike", and were neither of a structural nature nor induced by a combination of excessive demand and constraints on productive capacity in the economy. The reasons for the fairly dramatic increase in inflation were mainly related to the following:

- the sharp depreciation of the rand towards the end of 2001;
- rising food prices (as a result of, *inter alia*, international wheat shortages and a severe drought in Sub-Saharan Africa); and
- the high oil price of the past eighteen months (as a result of socio-political unrest in a number of major oil-producing countries).

Viewed from the perspective of the most recent trends, it is clear from both figures 1, 2 and 3 that the "inflationary spike" seems to be moving swiftly out of the equation.

5.2 The composition of CPI and PPI

A sharp contrast exists between rural and urban areas with regard to the weighting of the items included in the average basket of goods and services purchased by the average consumer. The major difference is to be found in the relative weighting of food and housing. For rural consumers, food comprises 43% of the total basket, whilst housing accounts for only 4.5%.

In metropolitan areas, food remains a significant element at 21% of the total, but housing is the single largest component, namely 22.1%.

Figure 5: Composition of CPI

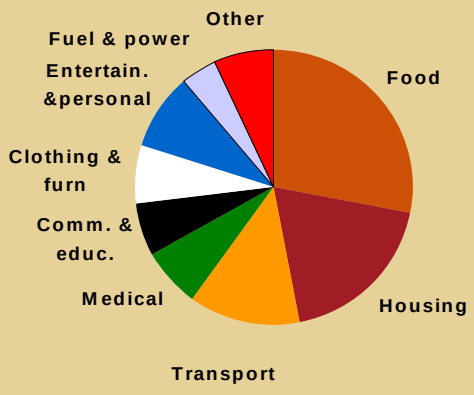


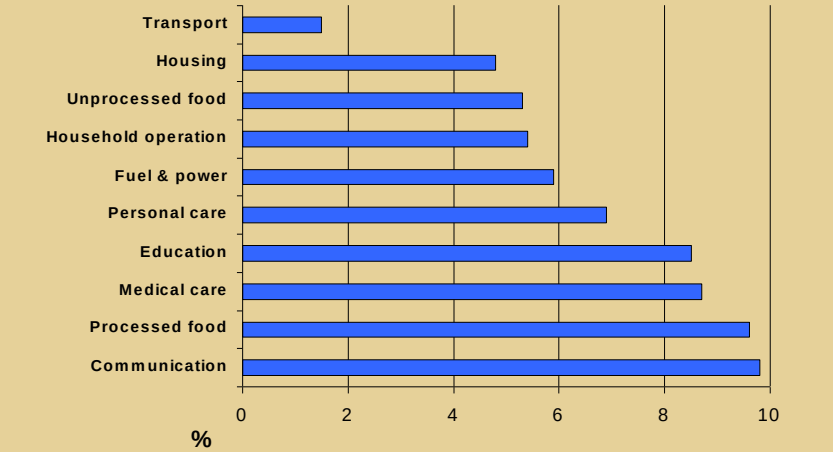
Figure 5 depicts the composition of CPI in terms of major product and service groups. Although fuel & power lags behind most of the other categories of expenditure (in terms of the weighting), it remains significant, and is a larger consumption cost item than any of the following groups:

- Non-alcoholic beverages
- Alcoholic beverages

- Tobacco products
- Furniture
- Household consumables
- Public transport
- Vegetables
- Fruit and nuts
- Communication
- Education
- Personal care

Figure 6 confirms the fact that inflationary pressures have subsided significantly since May 2003. Most of the major components of the CPI recorded annualised price increases of within the inflation target range set by the South African Reserve Bank (SARB), namely 3% to 6%. This includes the category for fuel and power.

Figure 6: Annualised CPI trends for selected groups - July 2003



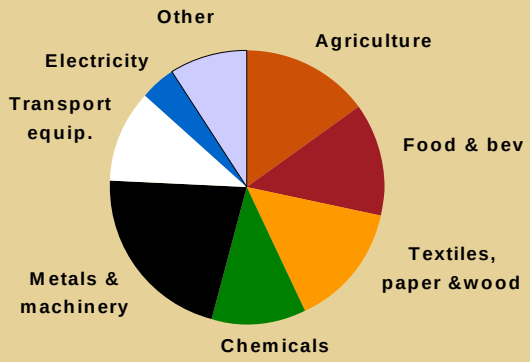
Due to the strong appreciation of the South African currency over the past twelve months, combined with lower food prices and modest declines in the price of oil, the downward trend in CPI is widely expected to gather momentum during the next six months. In response to the declining trend in the CPI, the SARB has started to ease monetary policy, with three interest rate cuts having been announced between June and September 2003.

As a result of less restrictive monetary policy, South Africa's prime overdraft rate has been lowered from 17% in the beginning of June 2003 to 13.5% on 10 September 2003. The consensus opinion amongst 30 leading economists participating in an annual forecasting competition (published by a daily newspaper, *Sake-Beeld),* suggests that the prime overdraft rate could drop to between 11% and 12% early in 2004. However,

interest rates are likely to increase again marginally during the course of 2004, due to an anticipated deterioration of the current account of the balance of payments.

Turning to the PPI, it is clear from figure 7 that electricity does not constitute one of the major cost components in the overall weighting of production prices by origin and group.

Figure 7: Composition of PPI



Furthermore, no significant deviation exists between the weighting of electricity costs between household consumers and producers. The PPI weighting of electricity is 4.17%, whilst the weighting of the fuel and power item in the composition of CPI is 3.49%.

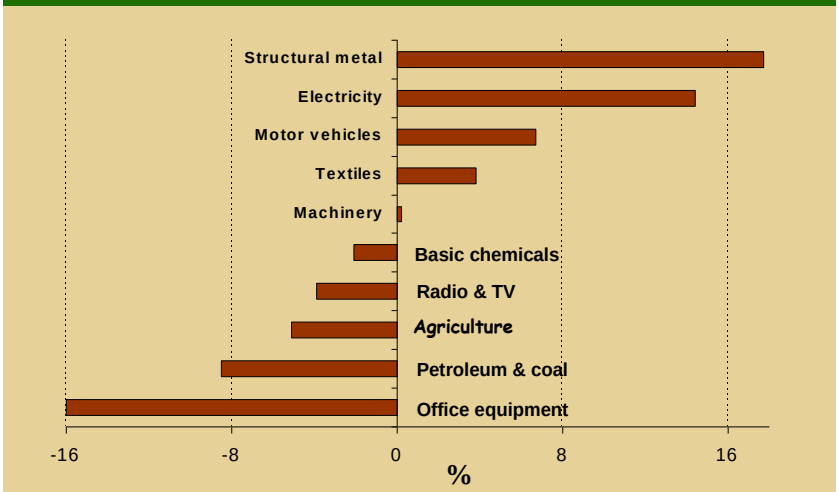
Figure 8 depicts the large deviations in price trends for a number of key components of the PPI. These deviations are significantly more pronounced than the differences between the price trends of individual CPI groups, which serves to explain the larger degree of historical volatility of the PPI.

It is clear from the data in this figure that the strengthening of the rand has played a major role in curbing production price increases. It stands to reason that any future depreciation of the rand will halt the downward trend in the PPI, and any significant weakening of the currency could trigger a new inflationary spike.

The SARB is on record, however, through various policy statements, for being committed to prevent the rand from repeating the kind of depreciation that was experienced in 2001.

Strong and sustained inflows on the financial account of the balance of payments are expected to continue to stabilise the rand during the next year.

Figure 8: Annualised PPI trends of selected groups - July 2003



Reasons for optimism over the above scenario include the following:

- The elimination during May 2003 of the net open forward position (NOFP), which was created during the 1998 emerging market financial turmoil. The NOFP stood at $23 billion at the end of 1998.
- A structural increase in South Africa's ratio of exports to gross domestic product (GDP), namely from 21.5% in 1993 to 34% in 2002.
- The maintenance of relatively high interest rates, which has resulted in strong non-resident bond purchases.
- Successive upgrades in investor status by rating agencies such as Standard & Poor's, and Fitch and Moody's. Arguably the strongest vindication of the gradual strengthening of international investment perceptions of socio-political stability in South Africa is to be found in the successful eurobond issue of 9 May 2003. The 1.25 billion eurobond was issued at a spread of only 1.42 percentage points over the equivalent German government bond, which is a massive 57% lower than the spread that was achieved with a eurobond issue in 1999.

5.3 The cost composition of electricity

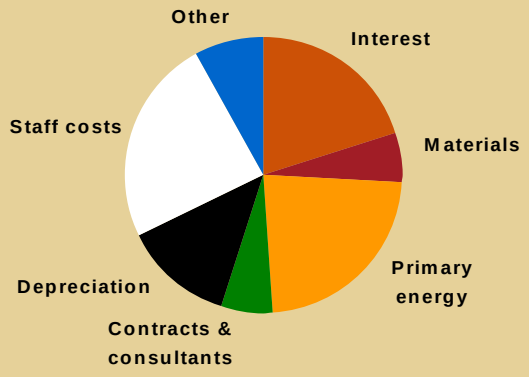
In order to determine whether BPC stands to gain from maintaining the *status quo* for the basis of future electricity price escalations, it is necessary to examine the current and envisaged future cost trends for the electricity industry. Two of the possible norms for price escalations are a CPI-base or a PPI-base. The third, which could, in future, realistically be suggested by Eskom, is to base price escalations on cost-reflective increases in the electricity industry.

The starting point for analysing price trends in the generation, transmission and distribution of electricity, is to provide an overview of the expenditure side of Eskom's Income Statement. This is depicted in detail by table 1, whilst figure 9 illustrates the composition of Eskom's cost structure in terms of key component groups.

Table 1: Composition of Eskom expenditure - financial year ended Dec. 2002

	Rm
Staff costs	6,446
Primary energy	6,199
Interest	5,242
Depreciation	3,480
Materials	1,529
Other operating expenses	1,159
Contracts	1,097
Other expenses	509
Transport	472
Managerial fees	431
Value loss on financial instruments	118
Directors' emoluments	22
Auditors' remuneration	19
Total	**26,723**

Figure 9 :Composition of Eskom's key cost items - 2002



A combination of only three cost items contribute exactly two-thirds of the total cost of electricity supply, namely staff costs (mainly salaries and wages), primary energy (mainly coal purchases) and interest (mainly locally issued bonds). The next step in the cost analysis is to calculate a likely future scenario for price escalations. For the short-

term (one year hence), this exercise requires an overview of current price escalation trends for the key cost components of the electricity industry. This information is provided in table 2. One of the features of the data depicted by this table is the relatively large deviations in current annual escalations between the different cost items.

The next step is to determine the weighting of the different cost components, and then to apply this weighting to the cost escalation factor for each item. This exercise is depicted in table 3, which results in a projected average electricity price increase of approximately 13%.

Table 2: Annualised price indices for products associated with electricity Generation – July 2003

	%
Salaries & wages (electricity)	34.8
Coal (Peas, grade A)	19.1
Electricity	14.4
Coal (Large nuts, grade A)	13.5
Coal (Average)	13.3
Coal (Small nuts, grade A)	10.7
Electricity apparatus	4.2
Gas, steam & water	2.5
Bituminous coal (export)	2.5
Electric generators	1.6
PPI (total)	**1.5**
Insulated wire and cable	-0.9
Basic metals	-2.8
Coal (Cobbles, grade A)	-3

Table 3: Calculation of envisaged annualised cost increases for Eskom

	Cost composition (%)	**Escalation factor (annualised % change)**	**Extrapolated contribution to annualised % change**
Interest	20.1	8.5	1.70
Primary energy	23.2	13.3	3.09
Staff costs	24.1	34.8	8.39
Materials	5.7	1.9	0.11
Contracts	4.1	10	0.41
Transport	1.8	1.5	0.03
Depreciation	13.0	-7	-0.91
Managerial fees	1.8	10	0.18
Other operating expenses	4.3	1.5	0.07
Other expenses	1.9	0	0.00
Total	100		**13.06**

5.4 Forecast price trends for electricity, CPI and PPI

As alluded to in section 5.1, inflationary trends caused by high food and oil prices and the weakness of the rand in 2001 started to ease during the second half of 2003. The return to a significantly larger degree of price stability in the South African economy has been reflected in the following trends:

- a sharp drop in production prices (from a peak of 15,4% in September 2002 to 1.5% in July 2003; and
- a more modest decline in the CPI, from a peak of 13% in October 2002 to 5.2% in July 2003.

According to the *Sake-Beeld* panel of 30 economists, the consensus view holds that CPI will average 4.1% during 2004. This is well within the inflation target range of the SARB. The view on PPI is highly dependent on the envisaged performance of the rand, as well as future oil price trends.

Sluggish World growth for the remainder of 2003 and the beginning of 2004 will continue to place downward pressure on oil prices, as will the continuous discovery and development of new oil fields and alternative energy resources. These trends will, however, be counter-balanced by the approaching European winter, which inevitably leads to a fairly strong increase in the demand for oil-generated energy.

Under these circumstances, as well as the prospects for an indefinite continuation of relatively strict monetary policy, a strong likelihood exists that the PPI will closely track the CPI during the next two to four years.

Turning to the envisaged future costs associated with electricity supply, the picture is not remotely as positive as for consumer and production prices in general. The major reason for the bearish view on future electricity costs is related to the impending capacity constraints faced by Eskom.

Since 1993, the total nominal power capacity of power stations has grown by only 5.7%, whilst the peak demand on Eskom's integrated system has grown by 36%. As a result, a number of previously mothballed power stations are expected to be refurbished and made operational again within the next two to four years. They are:

- Camden (Ermelo);
- Grootvlei (Balfour); and
- Komati (Middelburg, Mpumalanga).

It is envisaged that South Africa would require at least one more power station with a 3,600 MegaWatt capacity before the end of the decade, and thereafter another one every three years. According to price estimates conducted by Eskom, the new capacity will cost eight times as much as the existing capacity.

Another reason also exist that point to a reversal of the trend (over the past decade) for electricity prices to increase at slower rates than inflation.

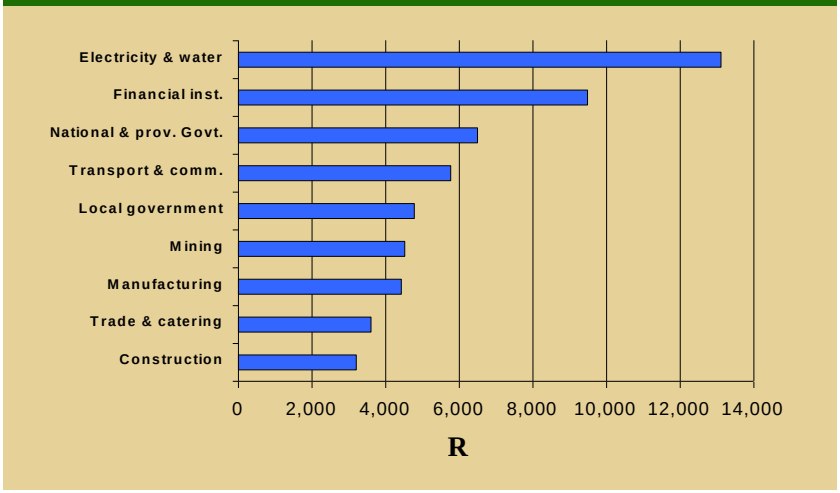
Staff costs are expected to continue to rise at rates that are significantly above inflation. The electricity sector in South Africa relies on a variety of highly skilled professions, which are in short supply in South Africa, and requires a so-called “retention premium”.

Staff costs constitute a significant portion of the total costs within the electricity value chain. For the three different key stages, the contributions to total costs are as follows:

- Generation – 15%
- Transmission – 33%
- Distribution – 38%

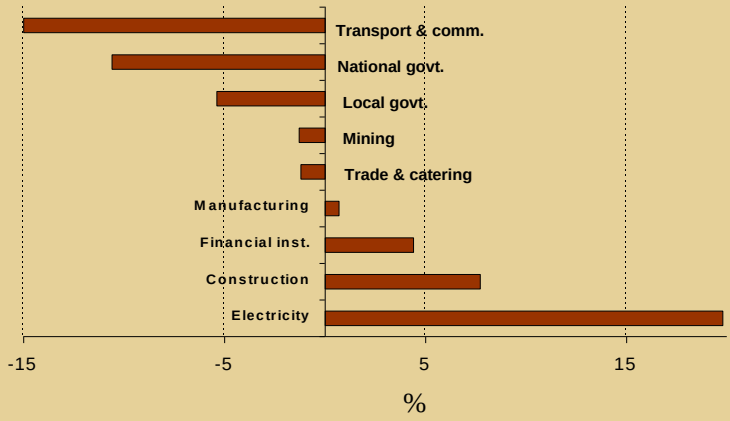
Figure 10 illustrates the fact that the electricity sector in South Africa enjoys by a substantial margin the highest level of average salaries and wages (in absolute terms). Figure 11 confirms the fact that the electricity sector is currently experiencing high levels of increases in labour cost trends, compared to the other sectors of the economy.

Figure 10: Average monthly salaries & wages by sector (February 2003)



It seems fairly obvious, given the prospect of sustained high interest rates, combined with the strong growth in demand for electricity, that price trends in electricity supply will start escalating within the next couple of years.

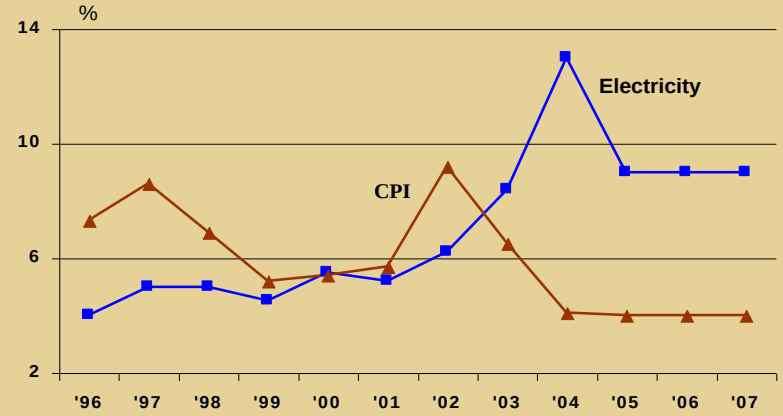
Figure 11: Annualised increase in salaries & wages by sector - February 2003



Thereafter, electricity price trends are expected to increase at higher rates than inflation, in order to accommodate the need for new (and expensive capacity).

The fact that South Africa boasts the lowest electricity prices (for industrial use) in the World means that Eskom will not be faced with undue pressure to continue its low price escalation policy of the past decade. Figure 12 illustrates the historical link between the CPI and electricity prices since 1994, as well as a forecast for price trends towards the end of the decade.

Figure 12: Forecasts for CPI and electricity cost increases



6. CONCLUSIONS AND RECOMMENDATIONS

The conclusions arrived at in this report are as follows:

- A positive link exists between the CPI and the PPI. This correlation is referred to as a lagged correlation, with changes in the PPI eventually affecting the CPI.
- Significantly higher volatility exists with regard to the PPI, both in the short term and in the long term.
- Average annualised changes to price indices tend to be marginally less volatile than the annualised change at any particular month-end.
- Following the recent “inflationary spike” that was experienced in South Africa, indications are that a period of relative price stability will ensue. In all probability, the Reserve Bank’s CPI target range of between 3% and 6% will be met for the remainder of 2003 and for the whole of 2004 and even beyond.
- Electricity prices in South Africa are expected to start increasing at higher rates than both the CPI and the PPI within the next two years. The main reasons are high anticipated increases in staff costs and capacity constraints as a result of a continued strong growth in demand.

In view of these findings, it is **recommended** that:

BPC should negotiate for a long-term pricing arrangement that is based on the average annualised increase in the CPI.